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ANNUAL
PROGRESS
REPORT

LIFE HISTORY STUDIES OF STRIPED BASS

AFS-2

July 1, 1968 to June 30, 1969

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STATE GAME AND FISH COMMISSION

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ANNUAL PROGRESS REPORT

ANADROMOUS FISH PROJECT

Project Title: Life History Studies of Striped Bass
Project Number: Georgia AFS-2
Project Period: January 1, 1967 to June 30, 1970
Report Period: July 1, 1968 to June 30, 1969

Prepared by: Larry D. Smith - Project Leader
L. Elyse Gardner - Secretary

Cooperator: Sport Fisheries Division
Brunswick, Georgia

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INTRODUCTION

The present life history study is the first of its kind conducted on striped bass, (Morone saxatilis) (Walbaum), in the streams of the Georgia Coast. It is aimed at further investigations into specific problems of low population density. The study was initiated January 1, 1967, in the Altamaha and Ogeechee River Systems. Effective July 1, 1967, the project was expanded to include the Savannah River System. Effective July 1, 1968, the Ogeechee River System was excluded from project activities. [illegible] for Fiscal Year 1969, therefore, will include information on the Altamaha and Savannah River Systems.

The Altamaha River is formed at the confluence of the Oconee and Ocmulgee Rivers and flows approximately 137 miles southeasterly to the Atlantic Ocean. The Altamaha River is a large, moderately turbid stream characterized by sandy shoals and small islands. In the lower reaches, it broadens into a large estuarine system which culminates as Altamaha Sound. The main tributary streams, the Oconee and Ocmulgee Rivers, originate in the Georgia Piedmont Province.

The Ogeechee River originates in Greene County, Georgia, and flows southeasterly approximately [illegible] miles where it culminates as Green Island Sound. It is a sandy, meandering stream, relatively clear and comparatively smaller than the Altamaha River.

The Savannah River is formed at the confluence of the Seneca and Tugaloo Rivers which have their headwaters on the southern slope of the Blue Ridge Mountains of North Carolina just north of the boundary with South Carolina and Georgia. The river meanders in a southeasterly

direction through the Piedmont Plateau and Coastal Plain and with certain of its tributaries, forms the boundary between Georgia and South Carolina from the North Carolina state line to the Atlantic Ocean.

Work Plan I

Job Number I

OBJECTIVES

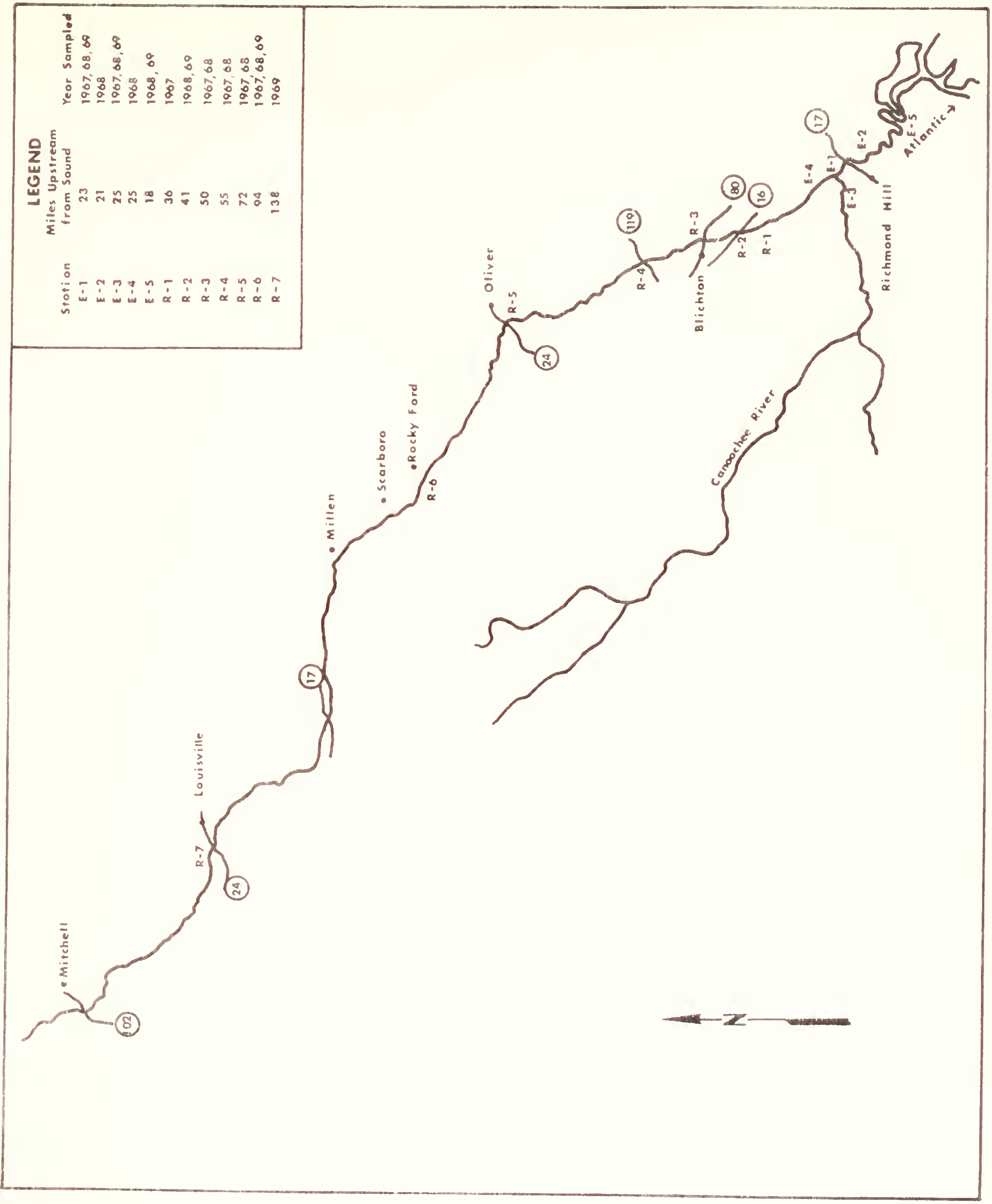
This segment of the project was initiated to delineate spawning areas utilized by striped bass in the Ogeechee and Savannah River Systems and to obtain information on relative abundance of larval populations.

PROCEDURES

Each study stream was divided in order to facilitate reporting the collection of striped bass eggs and larvae by zones. A sampling station was established at the lower end of each zone.

Three estuarine and three upstream stations were periodically sampled in the Ogeechee River System (Figure 1). Five estuarine and three upstream stations were sampled in the Savannah River System (Figures 2 and 3). All stations in both river systems were sampled at weekly intervals throughout the spawning season.

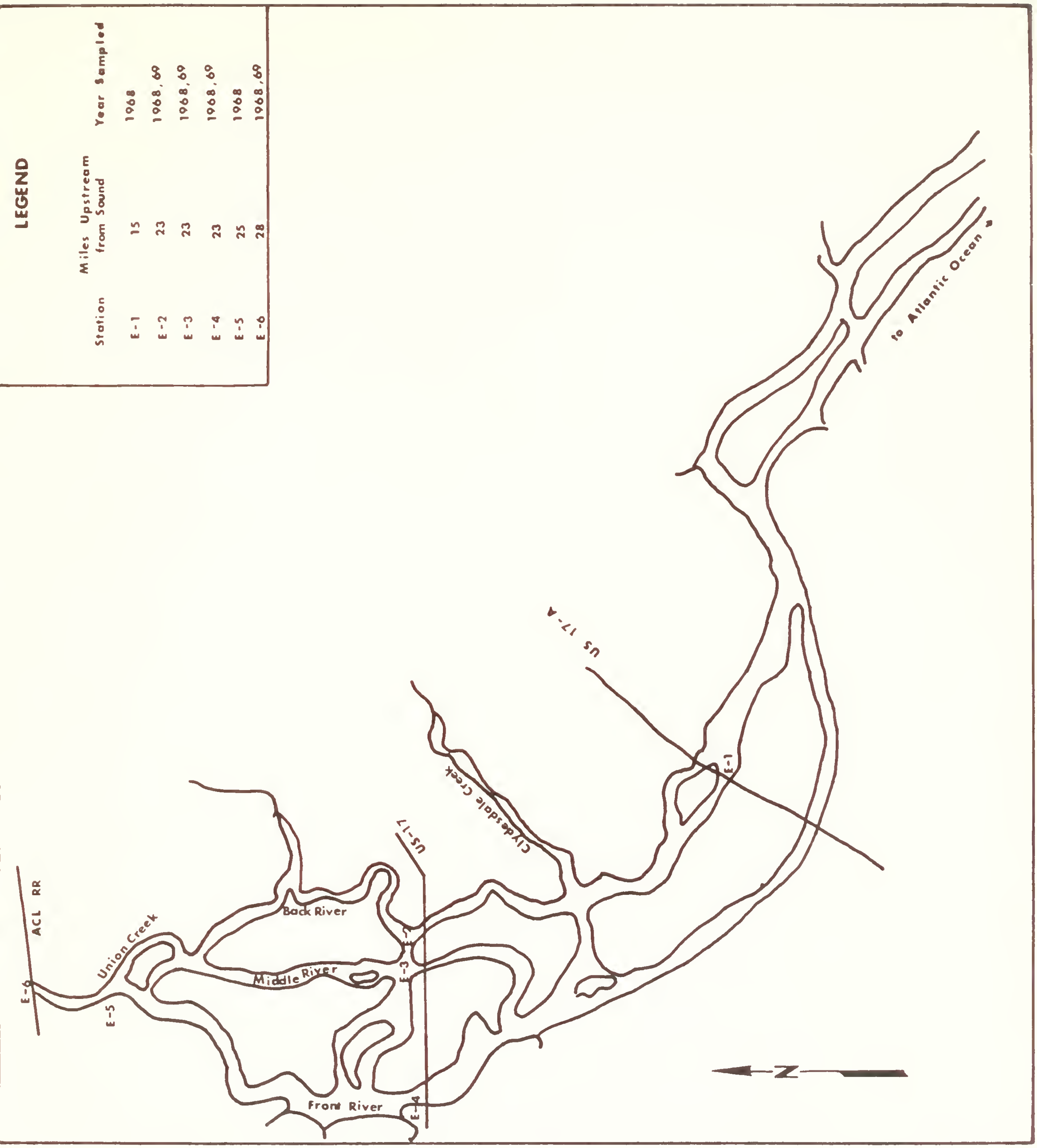
Sampling of eggs and larvae was conducted using plankton nets constructed of 15 mesh-per-inch silk bolting cloth. The cone-shape nets were five feet long, with an 18-inch diameter mouth. The nets



LEGEND

Station	Miles Upstream from Sound	Year Sampled
E-1	23	1967, 68, 69
E-2	21	1968
E-3	25	1967, 68, 69
E-4	25	1968
E-5	18	1968, 69
R-1	36	1967
R-2	41	1968, 69
R-3	50	1967, 68
R-4	55	1967, 68
R-5	72	1967, 68
R-6	94	1967, 68, 69
R-7	138	1969

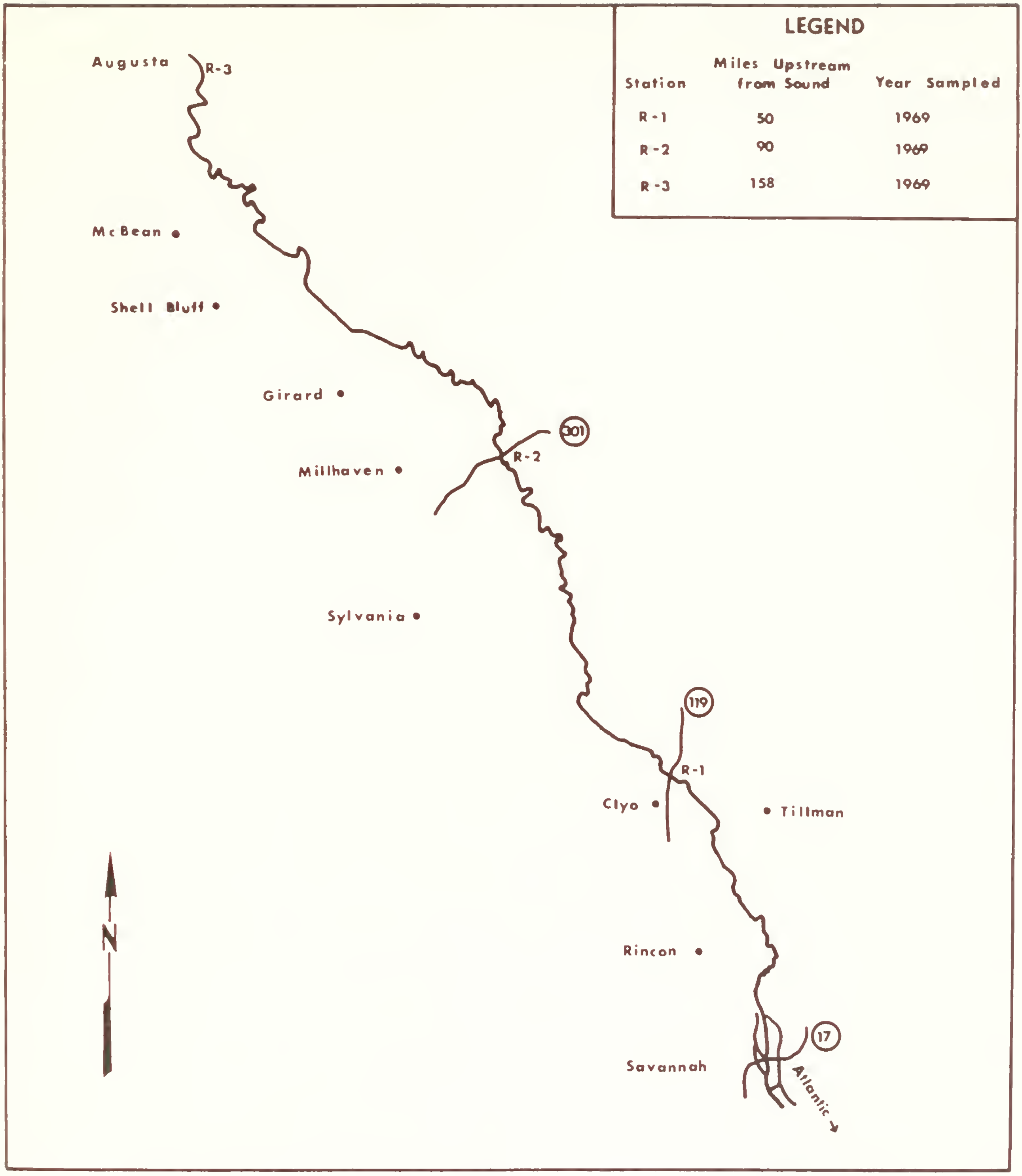
Figure 1. Ogeechee River System Showing Egg Net Sampling Stations During Spring 1967, 1968, and 1969.



LEGEND

Station	Miles Upstream from Sound	Year Sampled
E-1	15	1968
E-2	23	1968, 69
E-3	23	1968, 69
E-4	23	1968, 69
E-5	25	1968
E-6	28	1968, 69

Figure 2. Lower Savannah River System Showing Estuarine Egg Net Sampling Stations During Spring 1968 and 1969.



LEGEND

Station	Miles Upstream from Sound	Year Sampled
R-1	50	1969
R-2	90	1969
R-3	158	1969

Figure 3. Savannah River System Showing Upstream Egg Net Sampling Stations During Spring 1967, 1968, and 1969.

were anchored approximately eight inches above the bottom of the stream.

Nets were fished for periods of 15 minutes. Total hardness, salinity, temperature, and turbidity were determined for each station at times coincident with egg net sampling. Incidental information on tide stage was also recorded (Tables 1 and 2).

RESULTS

Ogeechee River System

A total of 135 egg net samples were collected during the period March 24, 1969, through June 12, 1969. Catch of striped bass eggs totaled 219. All eggs were collected from the estuarine zone (Table 3). Catch of eggs per 15-minute sample for all estuarine stations sampled was 2.96. All estuarine stations, with the exception of the station near the mouth of the Canoochee River, yielded eggs.

Developing eggs first appeared in the samples on April 1, 1969. Water temperature at this time was 64°F. Peak spawning activity, as manifest by high catch per unit of effort figures, was observed on April 29, 1969. The presence of eggs in the samples continued through May 12, 1969, at which time the water temperature was 74°F. (Table 1).

Salinities at times and locations with the appearance of eggs ranged from 2.0 to 3.8 grains per gallon chloride. Turbidity on the same dates ranged from 3 to 25 Jackson turbidity units.

TABLE 1. Water Quality Data Collected Incidentally During Egg Net Sampling in the Ogeechee River During the Period March 24, 1969 through June 12, 1969.

Station[3]	Date	Turbidity (jtu)	Temperature (°F.)	Tide	Dissolved Solids (ppm)[1]	Dissolved Solids (gpg)[2]
E-1	3/24/69	0	61°	1/6 E	35.8	2.1
	3/25/69	11.0	-	1/4 E	39.3	2.3
	3/26/69	5.0	-	1/4 E	110.9	6.5
	3/27/69	15.0	-	1/4 E	46.1	2.7
	3/28/69	10.0	-	1/4 E	35.8	2.1
	4/01/69	0	63°	2/3 E	34.1	2.0
	4/01/69	5.0	-	1/2 E	35.8	2.1
	4/02/69	17.0	-	2/3 E	49.5	2.9
	4/03/69	22.0	-	3/4 E	46.1	2.7
	4/04/69	10.0	-	1/2 E	41.0	2.4
	4/07/69	3.0	-	1/4 E	41.0	2.4
	4/08/69	4.0	68°	1/4 F	41.0	2.4
	4/15/69	18.0	67°	1/4 E	39.2	2.3
	4/16/69	25.0	-	3/4 E	56.3	3.3
	4/22/69	10.0	66°	3/4 E	44.4	2.6
	4/28/69	0	-	1/4 F	47.8	2.8
	4/29/69	5.0	70°	1/4 E	42.7	2.5
	4/29/69	15.0	-	3/4 E	44.4	2.6
	4/30/69	10.0	-	3/4 E	46.1	2.7
	5/05/69	10.0	-	3/4 F	41.0	2.4
	5/07/69	10.0	72°	1/6 E	41.0	2.4
	5/07/69	0	76°	3/4 F	47.8	2.8
	5/08/69	7.0	72°	1/4 E	51.2	3.0
	5/09/69	5.0	74°	1/2 E	51.2	3.0
	5/12/69	7.0	74°	1/4 E	51.2	3.0
	5/14/69	12.0	-	5/6 F	82.0	4.8
	5/21/69	35.0	72°	1/2 E	29.0	1.7
	5/22/69	9.0	74°	-	22.2	1.3
	5/29/69	11.0	72°	1/6 E	30.7	1.8
E-3	3/24/69	12.0	65°	-	34.1	2.0
	4/01/69	15.0	61°	-	37.5	2.2
	4/08/69	14.0	66°	-	37.5	2.2
	4/15/69	11.0	66°	-	41.0	2.4
	4/22/69	5.0	68°	-	42.7	2.5
	4/29/69	10.0	70°	-	37.5	2.2
	5/07/69	11.0	75°	-	42.7	2.5
	5/14/69	10.0	71°	-	42.7	2.5
	5/21/69	10.0	72°	-	34.1	2.0

Table 1. (continued)

Station[3]	Date	Turbidity (jtu)	Temperature (°F.)	Tide	Dissolved Solids (ppm)[1]	Dissolved Solids (gpg)[2]
E-5	3/24/69	20.0	63°	1/2 E	41.0	2.4
	4/01/69	8.0	64°	3/4 E	34.1	2.0
	4/08/69	5.0	68°	3/4 E	46.1	2.7
	4/15/69	8.0	68°	1/4 E	273.1	16.0
	4/22/69	8.0	69°	2/3 E	290.1	17.0
	4/29/69	12.0	71°	1/3 E	355.0	20.8
	5/07/69	22.0	72°	1/6 E	512.0	30.0
	5/14/69	38.0	73°	3/4 F	1706.7	100.0
	5/21/69	40.0	75°	1/6 E	51.2	3.0
	5/29/69	8.0	73°	-	27.3	1.6
R-2	3/24/69	7.0	62°	-	41.0	2.4
	4/01/69	10.2	62°	-	32.4	1.9
	4/08/69	8.0	67°	-	47.8	2.8
	4/15/69	10.0	66°	-	47.8	2.8
	4/22/69	15.0	64°	-	51.2	3.0
	4/29/69	11.0	66°	-	44.4	2.6
	5/07/69	10.0	71°	-	49.5	2.9
	5/14/69	15.0	71°	-	63.1	3.7
	5/21/69	8.0	72°	-	32.4	1.9
	5/29/69	9.0	72°	-	32.4	1.9
R-6	3/24/69	0	62°	-	39.3	2.3
	4/01/69	0	61°	-	37.5	2.2
	4/07/69	0	68°	-	44.4	2.6
	4/14/69	11.0	65°	-	46.1	2.7
	4/21/69	0	66°	-	49.5	2.9
	4/28/69	0	66°	-	44.4	2.6
	5/07/69	11.0	69°	-	51.2	3.0
	5/14/69	5.0	69°	-	56.3	3.3
	5/21/69	0	72°	-	30.7	1.8
	5/29/69	10.0	71°	-	35.8	2.1
R-7	4/03/69	10.0	62°	-	47.8	2.8
	4/08/69	20.0	62°	-	46.1	2.7
	4/16/69	30.0	63°	-	51.2	3.0
	4/23/69	40.0	59°	-	51.2	3.0
	4/29/69	40.0	64°	-	46.1	2.7
	5/08/69	30.0	62°	-	51.2	3.0
	5/14/69	28.0	63°	-	51.2	3.0
	5/22/69	69.0	68°	-	44.4	2.6
	5/28/69	25.0	71°	-	51.2	3.0
	6/06/69	30.0	68°	-	56.3	3.3
	6/12/69	42.0	75°	-	51.2	3.0

1/ ppm = parts per million $CaCO_3$

2/ gpg = grains per gallon, chloride (1 gpg is equivalent to 17.067 ppm salinity).

3/ Stations not shown were not sampled in 1969.

TABLE 2. Water Quality Data Collected Incidentally During Egg Net Sampling in the Savannah River During the Period March 25, 1969 through July 17, 1969.

Station[3/]	Date	Turbidity (jtu)	Temperature (°F.)	Tide	Dissolved Solids (ppm)[1/]	Dissolved Solids (gpg)[2/]
E-1	3/25/69	99.5	59°	1/2 F	337.9	19.8
E-2	3/25/69	11.0	62°	1/2 F	44.4	2.6
	3/31/69	42.0	62°	2/3 E	35.8	2.1
	4/07/69	60.0	66°	1/2 F	46.1	2.7
	4/14/69	50.0	66°	3/4 E	47.8	2.8
	4/21/69	45.0	66°	5/6 E	51.2	3.0
	4/28/69	62.0	68°	3/4 E	34.1	2.0
	5/07/69	25.0	66°	1/2 F	34.1	2.0
	5/14/69	80.0	69°	1/2 F	47.8	2.8
	5/22/69	28.0	72°	1/3 F	37.5	2.2
	5/29/69	22.0	72°	1/2 E	37.5	2.2
E-3	3/31/69	30.0	60°	1/2 E	39.2	2.3
	4/07/69	12.0	65°	1/2 F	39.2	2.3
	4/14/69	18.0	66°	3/4 F	64.9	3.8
	4/21/69	80.0	66°	3/4 E	39.2	2.3
	4/28/69	60.0	64°	2/3 E	34.1	2.0
	5/07/59	30.0	68°	5/6 F	30.7	1.8
	5/14/69	17.0	67°	1/6 F	46.1	2.7
	5/22/69	22.0	70°	1/3 F	39.2	2.3
	5/29/69	5.0	72°	1/2 E	39.2	2.3
E-4	3/25/69	35.0	61°	-	37.5	2.2
	3/31/69	47.0	60°	1/2 E	35.8	2.1
	4/14/69	25.0	66°	2/3 E	39.2	2.3
	4/21/69	95.0	66°	3/4 E	29.0	1.7
	4/28/69	30.5	64°	1/2 F	29.0	1.7
	5/07/69	15.0	66°	1/2 F	32.4	1.9
	5/14/69	30.0	67°	3/4 F	51.2	3.0
	5/22/69	20.0	70°	1/2 E	34.1	2.0
	5/29/69	22.0	72°	1/2 E	37.5	2.2
E-6	3/25/69	51.0	60°	-	34.1	2.0
	3/31/69	20.0	61°	-	35.8	2.1
	4/07/69	21.0	64°	3/4 F	35.8	2.1
	4/14/69	22.0	65°	3/4 E	39.3	2.3
	4/21/69	99.0	65°	5/6 E	30.7	1.8
	4/28/69	28.5	65°	3/4 E	34.1	2.0
	5/07/69	10.0	66°	-	30.7	1.8
	5/14/69	11.0	67°	1/6 F	37.5	2.2
	5/22/69	20.0	70°	-	34.1	2.0
	5/29/69	32.0	72°	-	37.5	2.2

Table 2. (continued)

Station 3/	Date	Turbidity (jtu)	Temperature (°F.)	Tide	Dissolved Solids (ppm) 1/	(gpg) 2/
R-1	3/25/69	10.0	60°	-	34.1	2.0
	3/31/69	28.0	60°	-	384.0	22.5
	4/07/69	24.0	62°	-	37.5	2.2
	4/14/69	31.0	64°	-	34.1	2.0
	4/21/69	70.0	66°	-	25.6	1.5
	4/28/69	20.0	64°	-	25.6	1.5
	5/07/69	10.0	65°	-	30.7	1.8
	5/14/69	10.0	66°	-	44.4	2.6
	5/22/69	32.0	70°	-	41.0	2.4
	5/29/69	32.0	72°	-	41.0	2.4
R-2	3/31/69	20.0	58°	-	34.1	2.0
	4/07/69	14.0	62°	-	39.2	2.3
	4/14/69	15.0	61°	-	37.5	2.2
	4/21/69	55.0	64°	-	29.0	1.7
	5/14/69	35.0	66°	-	39.3	2.3
	5/22/69	35.0	69°	-	37.5	2.2
	5/29/69	25.0	72°	-	39.3	2.3
R-3	4/13/69	33.0	52°	-	56.3	3.3
	4/08/69	48.0	54°	-	47.8	2.8
	4/16/69	79.0	55°	-	51.2	3.0
	4/29/69	40.0	54°	-	47.8	2.8
	5/08/69	33.0	58°	-	42.7	2.5
	5/14/69	20.0	58°	-	46.1	2.7
	5/23/69	30.0	63°	-	42.7	2.5
	5/28/69	34.0	65°	-	39.3	2.3
	6/05/69	32.0	64°	-	44.4	2.6
	6/12/69	40.0	67°	-	44.4	2.6
	6/19/69	29.0	67°	-	47.8	2.8
	6/24/69	15.0	71°	-	47.8	2.8
	7/02/69	40.0	70°	-	44.4	2.6
	7/10/69	35.0	68°	-	49.5	2.9
	7/17/69	15.0	69°	-	51.2	3.0

1/ ppm = parts per million $CaCO_3$

2/ gpg = grains per gallon, chloride (1 gpg is equivalent to 17.067 ppm. salinity).

3/ Stations not shown were not sampled in 1969.

TABLE 3. Data on Striped Bass Eggs Collected in the Ogeechee River System During the Period March 24, 1969 through June 12, 1969.

Zone and Station[1/]	Date	Number of Eggs	Number of Nets	Catch per Net
Estuarine				
1	3/24/69	0	2	0.00
	3/25/69	0	1	0.00
	3/26/69	0	1	0.00
	3/27/69	0	1	0.00
	3/28/69	0	1	0.00
	4/01/69	0	3	0.00
	4/02/69	0	1	0.00
	4/03/69	0	1	0.00
	4/04/69	1	1	1.00
	4/07/69	0	1	0.00
	4/08/69	2	2	1.00
	4/15/69	3	2	1.50
	4/16/69	0	1	0.00
	4/22/69	8	2	4.00
	4/28/69	0	1	0.00
	4/29/69	144	3	48.00
	4/30/69	0	1	0.00
	5/05/69	8	1	8.00
	5/07/69	7	3	2.33
	5/08/69	0	1	0.00
	5/09/69	2	1	2.00
	5/12/69	1	1	1.00
	5/14/69	0	2	0.00
	5/21/69	0	2	0.00
	5/22/69	0	1	0.00
	5/29/69	0	2	0.00
TOTAL		176	39	4.51
3	3/24/69	0	2	0.00
	4/01/69	0	2	0.00
	4/08/69	0	2	0.00
	4/15/69	0	2	0.00
	4/22/69	0	2	0.00
	4/29/69	0	2	0.00
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/21/69	0	2	0.00
TOTAL		0	18	0.00

Table 3. (continued)

Zone and Station[1/]	Date	Number of Eggs	Number of Nets	Catch per Net
Estuarine				
5	3/24/69	0	2	0.00
	4/01/69	10	2	5.00
	4/08/69	33	2	16.50
	4/15/69	0	2	0.00
	4/22/69	0	1	0.00
	4/29/69	0	2	0.00
	5/21/69	0	2	0.00
	5/29/69	0	2	0.00
	6/07/69	0	2	0.00
TOTAL		43	17	2.53
TOTAL FOR ZONE		219	74	2.96
River				
2	3/24/69	0	2	0.00
	4/01/69	0	2	0.00
	4/08/69	0	2	0.00
	4/15/69	0	2	0.00
	4/22/69	0	2	0.00
	4/29/69	0	2	0.00
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/21/69	0	2	0.00
	5/29/69	0	2	0.00
TOTAL		0	20	0.00
6	3/24/69	0	2	0.00
	4/01/69	0	2	0.00
	4/07/69	0	2	0.00
	4/14/69	0	2	0.00
	4/21/69	0	2	0.00
	4/28/69	0	2	0.00
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/21/69	0	2	0.00
	5/29/69	0	2	0.00
TOTAL		0	20	0.00

Table 3. (continued)

Zone and Station[1]	Date	Number of Eggs	Number of Nets	Catch per Net
River				
7	4/03/69	0	1	0.00
	4/08/69	0	2	0.00
	4/16/69	0	2	0.00
	4/23/69	0	2	0.00
	4/29/69	0	2	0.00
	5/08/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/28/69	0	2	0.00
	6/06/69	0	2	0.00
	6/12/69	0	2	0.00
TOTAL		0	21	0.00
TOTAL FOR ZONE		0	61	0.00
TOTAL FOR SYSTEM		219	135	1.62

1/ Stations not shown were not sampled in 1969.

Savannah River System

A total of 139 egg net samples were collected during the period March 25, 1969, through July 17, 1969. Catch of striped bass eggs totaled 438. Five eggs were collected from the station at U.S. Highway 119. The remainder were collected throughout the estuarine zone (Table 4). Catch of eggs per 15-minute sample for the estuarine zone was 5.62.

Developing eggs first appeared in the samples on March 31, 1969. Water temperature at this time was 62°F. Peak spawning activity was observed on April 7, 1969. Presence of eggs in the samples continued through May 29, 1969, at which time the water temperature was 72°F.

Salinities at times coincident with the appearance of eggs ranged from 2.0 to 3.8 grains per gallon chloride. Turbidity on the same dates ranged from 12 to 62 Jackson turbidity units (Table 2).

DISCUSSION

It is ascertained, on the basis of past sampling, that the primary spawning areas in both rivers is proximal to the estuarine environment. These areas are characterized by little or no detectable salinity. prevalent tidal velocity. and fairly high turbidity.

Savannah Back River, near station E-2, appears to be the primary spawning site in the Savannah River System. Data collected during the 1968 and 1969 spawning season substantiate this ascertion.

TABLE 4. Data on Striped Bass Eggs Collected in the Savannah River System During the Period March 25, 1969 through July 17, 1969.

Zone and Station[1/]	Date	Number of Eggs	Number of Nets	Catch per Net
Estuarine				
1	3/25/69	0	1	0.00
2	3/25/69	0	2	0.00
	3/31/69	19	2	9.50
	4/07/69	214	2	107.00
	4/14/69	36	2	18.00
	4/21/69	2	2	1.00
	4/28/69	30	2	15.00
	5/07/69	12	2	6.00
	5/14/69	9	2	4.50
	5/22/69	10	2	5.00
	5/29/69	0	2	0.00
TOTAL		332	20	16.60
3	3/31/69	0	2	0.00
	4/07/69	6	2	3.00
	4/14/69	39	2	19.50
	4/21/69	3	2	1.50
	4/28/69	1	2	0.50
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/29/69	0	2	0.00
TOTAL		49	18	2.72
4	3/25/69	0	2	0.00
	3/31/69	0	2	0.00
	4/14/69	18	2	9.00
	4/21/69	0	2	0.00
	4/28/69	0	2	0.00
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/29/69	0	2	0.00
TOTAL		18	18	1.00

Table 4. (continued)

Zone and Station[1/]	Date	Number of Eggs	Number of Nets	Catch per Net
Estuarine				
6	3/25/69	0	2	0.00
	3/31/69	0	2	0.00
	4/07/69	0	2	0.00
	4/14/69	0	2	0.00
	4/21/69	0	2	0.00
	4/28/69	0	2	0.00
	5/07/69	0	2	0.00
	5/14/69	33	2	16.50
	5/22/69	1	2	0.50
	5/29/69	0	2	0.00
TOTAL		34	20	1.70
TOTAL FOR ZONE		433	77	5.62
River				
1	3/25/69	0	2	0.00
	3/31/69	0	2	0.00
	4/07/69	3	2	1.50
	4/14/69	0	2	0.00
	4/21/69	0	2	0.00
	4/28/69	0	1	0.00
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/29/69	2	2	1.00
TOTAL		5	19	0.26
2	3/31/69	0	2	0.00
	4/07/69	0	2	0.00
	4/14/69	0	2	0.00
	4/21/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/29/69	0	2	0.00
TOTAL		0	14	0.00

Table 4. (continued)

Zone and Station[1]	Date	Number of Eggs	Number of Nets	Catch per Net
River				
3	4/03/69	0	1	0.00
	4/08/69	0	2	0.00
	4/16/69	0	2	0.00
	4/23/69	0	2	0.00
	4/29/69	0	2	0.00
	5/08/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/28/69	0	2	0.00
	6/06/69	0	2	0.00
	6/12/69	0	2	0.00
	6/24/69	0	2	0.00
	7/02/69	0	2	0.00
	7/10/69	0	2	0.00
	7/17/69	0	2	0.00
TOTAL		0	29	0.00
TOTAL FOR ZONE		5	62	0.08
TOTAL FOR SYSTEM		438	139	3.15

---

[1] Stations not shown were not sampled in 1969.

Work Plan I
Job Number II

OBJECTIVE

The objective of this phase of the study is to determine the distribution patterns of fry and fingerling striped bass in the Ogeechee and Savannah River Systems.

PROCEDURE

Sampling of fry was conducted coincidentally with egg net sampling during spring, 1969. Sampling of fingerlings was conducted during summer and fall, 1968, using a ten-foot otter trawl. Standard unit of effort was a five-minute sample.

All sampling was conducted in the estuarine zones of both systems (Figures 4 and 5).

RESULTS

Ogeechee River System

A total of 135 egg net samples yielded 16 striped bass fry (Table 5). Fry were present in the samples from April 29, 1969, through May 14, 1969. Location of occurrence of fry corresponded with egg collections.

A total of 81 five-minute trawl samples yielded 53 fingerling striped bass (Table 6). All specimens were collected from stations six, seven, and nine (Figure 4). The number of fingerlings obtained from these stations declined progressively through the summer months. This seems to be indicative of grouping or schooling early in the summer followed by dispersal as fall approaches. Fish collected late

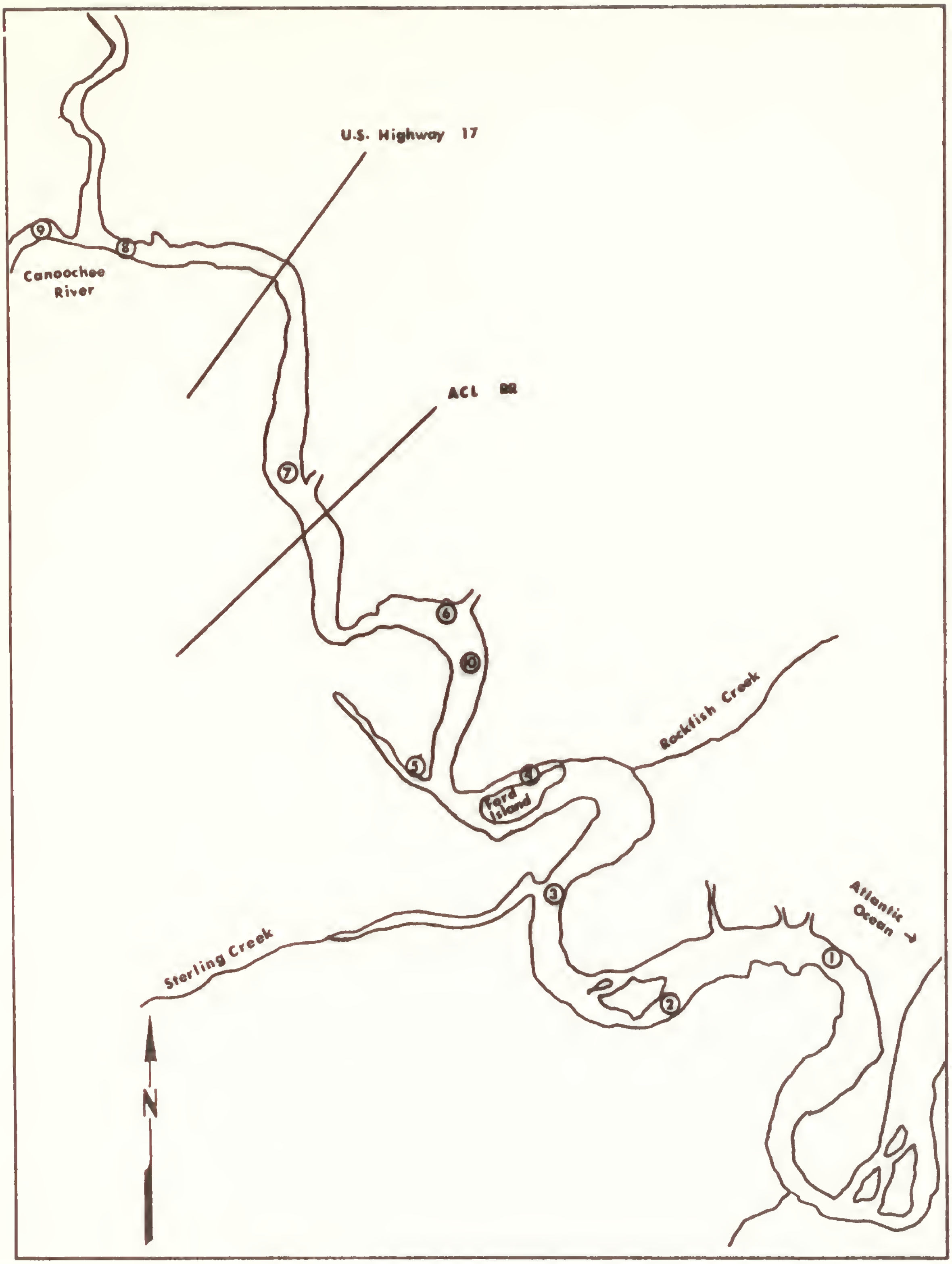


Figure 4. Estuarine Zone of the Ogeechee River Showing fingerling Striped Bass Sampling Stations During Summer and Fall, 1969.

[illegible]

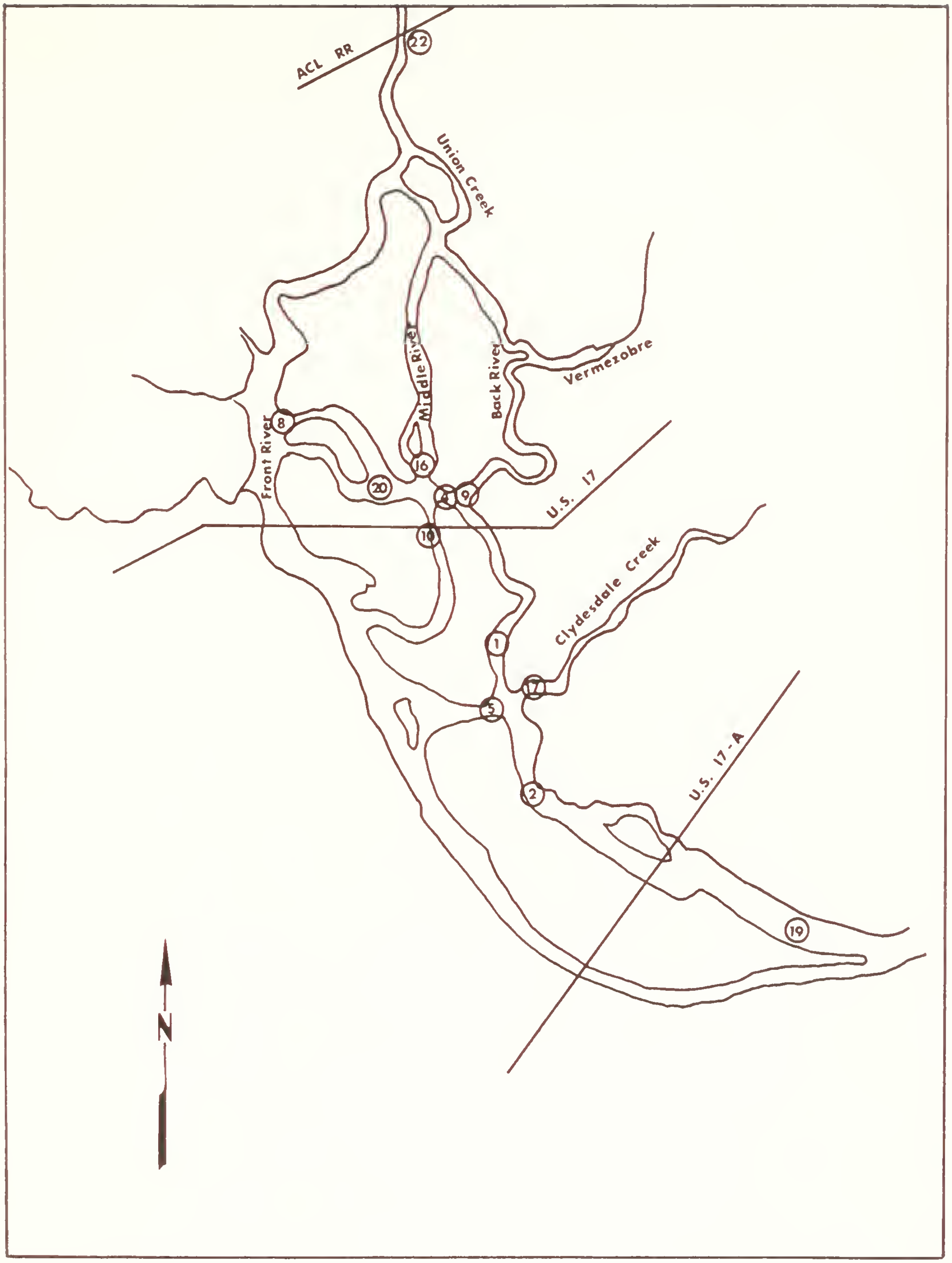


Figure 5. Estuarine Zone of the Savannah River Showing Fingerling Striped Bass Sampling Stations During Summer and Fall, 1969.

TABLE 5. Data on Fry Collected During Egg Net Sampling in the Ogeechee River System During the Period July 1, 1968 through June 30, 1969.

Zone and Station[1/]	Date	Number of Fry	Number of Nets	Catch per Net
Estuarine				
1	3/24/69	0	2	0.00
	3/25/69	0	1	0.00
	3/26/69	0	1	0.00
	3/27/69	0	1	0.00
	3/28/69	0	1	0.00
	4/01/69	0	3	0.00
	4/02/69	0	1	0.00
	4/03/69	0	1	0.00
	4/04/69	0	1	0.00
	4/07/69	0	1	0.00
	4/08/69	0	2	0.00
	4/15/69	0	2	0.00
	4/16/69	0	1	0.00
	4/22/69	0	2	0.00
	4/28/69	0	1	0.00
	4/29/69	11	3	3.67
	4/30/69	0	1	0.00
	5/05/69	0	1	0.00
	5/07/69	0	3	0.00
	5/08/69	1	1	1.00
	5/09/69	0	1	0.00
	5/12/69	0	1	0.00
	5/14/69	3	2	1.50
	5/21/69	0	2	0.00
	5/22/69	0	1	0.00
	5/29/69	0	2	0.00
TOTAL		15	39	0.38
3	3/24/69	0	2	0.00
	4/01/69	0	2	0.00
	4/08/69	0	2	0.00
	4/15/69	0	2	0.00
	4/22/69	0	2	0.00
	4/29/69	0	2	0.00
	5/07/69	0	2	0.00
	5/14/69	0	1	0.00
	5/21/69	0	2	0.00
TOTAL		0	17	0.00

Table 5. (continued)

Zone and Station1/	Date	Number of Fry	Number of Nets	Catch per Net
Estuarine				
5	3/24/69	0	2	0.00
	4/01/69	0	2	0.00
	4/08/69	0	2	0.00
	4/15/69	0	2	0.00
	4/22/69	0	1	0.00
	4/29/69	1	2	0.50
	5/21/69	0	2	0.00
	5/29/69	0	2	0.00
	6/07/69	0	2	0.00
TOTAL		1	17	0.06
TOTAL FOR ZONE		16	73	0.22
River				
2	3/24/69	0	2	0.00
	4/01/69	0	2	0.00
	4/08/69	0	2	0.00
	4/15/69	0	2	0.00
	4/22/69	0	2	0.00
	4/29/69	0	2	0.00
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/21/69	0	2	0.00
	5/29/69	0	2	0.00
TOTAL		0	20	0.00
6	3/24/69	0	2	0.00
	4/01/69	0	2	0.00
	4/07/69	0	2	0.00
	4/14/69	0	2	0.00
	4/21/69	0	2	0.00
	4/28/69	0	2	0.00
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/21/69	0	2	0.00
	5/29/69	0	2	0.00
TOTAL		0	20	0.00

Table 5. (continued)

Zone and Station[1]	Date	Number of Fry	Number of Nets	Catch per Net
Estuarine				
7	4/03/69	0	1	0.00
	4/08/69	0	2	0.00
	4/16/69	0	2	0.00
	4/23/69	0	2	0.00
	4/29/69	0	2	0.00
	5/08/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/28/69	0	2	0.00
	6/06/69	0	2	0.00
	6/12/69	0	2	0.00
TOTAL		0	21	0.00
TOTAL FOR ZONE		0	61	0.00
TOTAL FOR SYSTEM		16	134	0.12

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[1] Stations not shown were not sampled in 1969.

TABLE 6. Catch of Striped Bass Fingerlings per Standard Five-minute Sample Using a Ten-foot Otter Trawl in the Estuarine Zone of the Ogeechee River System During the Period June 17, 1968 through September 3, 1968.

Station	Date	Number of Fingerlings	Number of Nets	Catch per Net
1	6/20/68	0	2.2	0.00
	7/12/68	0	1.2	0.00
	7/25/68	0	3.6	0.00
	8/15/68	0	2.0	0.00
	9/03/68	0	1.0	0.00
TOTAL		0	10.0	0.00
2	6/20/68	0	1.8	0.00
	7/12/68	0	1.2	0.00
	7/25/68	0	3.0	0.00
	8/15/68	0	1.4	0.00
	9/03/68	0	1.6	0.00
TOTAL		0	9.0	0.00
5	8/15/68	0	1.6	0.00
6	6/20/68	25	2.8	8.92
	7/11/68	5	3.6	1.39
	7/25/68	1	2.0	0.50
	8/15/68	6	4.8	1.25
	9/03/68	1	2.4	0.55
TOTAL		38	15.6	2.43
7	6/17/68	10	3.0	3.33
	7/11/68	0	3.6	0.00
	7/23/68	4	3.6	0.11
	8/14/68	0	2.6	0.00
	9/03/68	0	1.0	0.00
TOTAL		14	13.8	1.01
8	6/17/68	0	3.8	0.00
	7/11/68	0	2.4	0.00
	7/23/68	0	3.0	0.00
	8/14/68	0	2.8	0.00
	9/03/68	0	1.0	0.00
TOTAL		0	13.0	0.00

Table 6. (continued)

Station	Date	Number of Fingerlings	Number of Nets	Catch per Net
9	7/11/68	0	2.0	0.00
	7/23/68	0	2.2	0.00
	8/14/68	0	1.8	0.00
	9/03/68	0	1.0	0.00
TOTAL		0	7.0	0.00
10	6/17/68	0	1.0	0.00
	7/11/68	1	0.8	1.25
TOTAL		1	1.8	0.55
11	6/20/68	0	3.2	0.00
	7/12/68	0	2.6	0.00
	7/25/68	0	3.4	0.00
	8/15/68	0	0.6	0.00
	9/03/68	0	1.0	0.00
TOTAL		0	10.8	0.00
GRAND TOTAL		53	82.6	0.64

in the period are much larger and undoubtedly more evasive of sampling gear than small fish. The fingerlings collected in the latter part of the summer then may be representative of the lower size range of the young-of-the-year population.

It appears that fingerling striped bass prefer areas of very low salinity as the stations producing specimens are characteristic of salinities less than one part per thousand.

Savannah River System

A total of 139 egg net samples yielded 107 striped bass fry (Table 7). Fry were present in the samples from April 14, 1969, through May 29, 1969, when egg net sampling was concluded. All fry were collected at stations E-2 and E-3. Eggs were also obtained from these stations. It is interesting to note that eggs were also found at E-4, E-6, and R-1, however, no fry were collected.

A total of 16.7 five-minute trawl samples produced a single fingerling striped bass (Table 8). This collection was made at station 17 in Back River (Figure 5).

Effective sampling with trawls in this system was difficult, due to the presence of numerous snags on the river bottom. It cannot, therefore, be conluded that the low catch figure is the result of low population density.

TABLE 7. Data on Fry Collected During Egg Net Sampling in the Savannah River System During the Period July 1, 1968 through June 30, 1969.

Zone and Station[1/]	Date	Number of Fry	Number of Nets	Catch per Net
Estuarine				
1	3/25/69	0	1	0.00
2	3/25/69	0	2	0.00
	3/31/69	0	2	0.00
	4/07/69	0	2	0.00
	4/14/69	17	2	8.50
	4/21/69	42	2	21.00
	4/28/69	46	2	23.00
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/29/69	1	2	0.50
TOTAL		106	20	5.30
3	3/31/69	0	2	0.00
	4/07/69	0	2	0.00
	4/14/69	0	2	0.00
	4/21/69	1	2	0.50
	4/28/69	0	2	0.00
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/29/69	0	2	0.00
TOTAL		1	18	0.06
4	3/25/69	0	2	0.00
	3/31/69	0	2	0.00
	4/14/69	0	2	0.00
	4/21/69	0	2	0.00
	4/28/69	0	2	0.00
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/29/69	0	2	0.00
TOTAL		0	18	0.00

Table 7. (continued)

Zone and Station[1]	Date	Number of Fry	Number of Nets	Catch per Net
Estuarine				
6	3/25/69	0	2	0.00
	3/31/69	0	2	0.00
	4/07/69	0	2	0.00
	4/14/69	0	2	0.00
	4/21/69	0	2	0.00
	4/28/69	0	2	0.00
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/29/69	0	2	0.00
TOTAL		0	20	0.00
TOTAL FOR ZONE		107	77	1.39
River				
1	3/25/69	0	2	0.00
	3/31/69	0	2	0.00
	4/07/69	0	2	0.00
	4/14/69	0	2	0.00
	4/21/69	0	2	0.00
	4/28/69	0	1	0.00
	5/07/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/29/69	0	2	0.00
TOTAL		0	19	0.00
2	3/31/69	0	2	0.00
	4/07/69	0	2	0.00
	4/14/69	0	2	0.00
	4/21/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/29/69	0	2	0.00
TOTAL		0	14	0.00

Table 7. (continued)

Zone and Station[1/]	Date	Number of Fry	Number of Nets	Catch per Net
River				
3	4/02/69	0	1	0.00
	4/08/69	0	2	0.00
	4/16/69	0	2	0.00
	4/23/69	0	2	0.00
	4/29/69	0	2	0.00
	5/08/69	0	2	0.00
	5/14/69	0	2	0.00
	5/22/69	0	2	0.00
	5/28/69	0	2	0.00
	6/06/69	0	2	0.00
	6/12/69	0	2	0.00
	6/24/69	0	2	0.00
	7/02/69	0	2	0.00
	7/10/69	0	2	0.00
	7/17/69	0	2	0.00
TOTAL		0	29	0.00
TOTAL FOR ZONE		0	62	0.00
TOTAL FOR SYSTEM		107	139	0.77

1/ Stations not shown were not sampled in 1969.

TABLE 8. Catch of Striped Bass Fingerlings per Standard Five-minute Sample Using a Ten-foot Otter Trawl in the Estuarine Zone of the Savannah River System During the Period August 12, 1968 through September 8, 1968.

Station	Date	Number of Fingerlings	Number of Nets	Catch per Net
1	8/12/68	1	1.0	0.00
2	8/12/68	0	1.0	0.00
	9/08/68	0	1.0	0.00
TOTAL		0	2.0	0.00
4	8/12/68	0	2.2	0.00
5	8/12/68	0	0.6	0.00
8	9/08/68	0	1.3	0.00
9	8/12/68	0	1.2	0.00
	9/08/68	0	0.8	0.00
TOTAL		0	2.0	0.00
10	8/12/68	0	1.4	0.00
16	8/12/68	0	0.6	0.00
17	8/12/68	1	1.2	0.83
19	9/08/68	0	1.0	0.00
20	9/08/68	0	1.2	0.00
21	9/08/68	0	1.2	0.00
22	9/08/68	0	1.0	0.00
GRAND TOTAL		1	16.7	0.07

Work Plan I
Job Number III

OBJECTIVE

It is the objective of this phase of the project to study the movements of subadult and adult striped bass throughout the project streams.

PROCEDURE

Striped bass were collected in the estuarine zones of the Ogeechee and Savannah Rivers, primarily with electrofishing apparatus. A few fish were also obtained with pound nets.

Striped bass were collected and placed in a wooden tank in the boat. Fish were then weighed and measured, a scale sample taken, tagged, dipped in a dilute solution of acriflavin, then returned to the river. The tag used was the Atkins-type nylon streamer, which was affixed using the technique described by Davis (1959). Tags were secured to the fish approximately one-half inch below and anterior to the insertion of the soft dorsal fin. The plastic discs were printed with the following information:

Side A	Side B
A-000	Return to: Ga. Game and Fish Comm. Brunswick, Ga. Reward

Rewards of either $1, $5, $10, or $25.00 were assigned each tag. When each tag was returned to the Brunswick Office, a money order in the amount of the reward, a receipt to be signed, and the following form letter and questionnaire were mailed to the fisherman.

Dear Fisherman:

The Georgia Game and Fish Commission is currently conducting studies of the striped bass (rockfish) resources on the Georgia Coast.

Commission Biologists are currently in the field attempting to follow the striped bass from the egg through the larval and juvenile stages to the adult fish. This is being accomplished by the use of nets to catch drifting eggs and larvae for the determination of spawning areas, and the use of nets and electricity to collect juvenile and adult fish for aging and migration studies.

One of the best sources of information about a fishery is the fisherman himself and this is why the Commission is requesting that you complete and return the enclosed post card. This will provide biologists with much needed information about the fishery, as well as giving you an opportunity to express your opinions about the striped bass situation in Georgia.

All information which you supply will be considered strictly from a biological point of view.

Your cooperation in the matter will be greatly appreciated.

Respectfully,

Fisheries Biologist

STRIPED BASS CATCH INFORMATION

NAME______________________________ PHONE NO.________________

ADDRESS____

TAG NUMBER__________________ DATE OF CAPTURE________________

LOCATION OF CAPTURE____

NUMBER OF FISHERMEN IN PARTY________________________________

TOTAL NUMBER OF STRIPED BASS CAUGHT BY PARTY________________

TYPE OF GEAR USED____

COMMENTS:____

Tagging operations were conducted in the late fall and winter months, when striped bass congregate in the estuarine areas. Attempts were made to tag fish at other times throughout the year, however, sufficient concentrations of fish were not located.

RESULTS

Ogeechee River System

A total of 131 subadult and adult striped bass were tagged during the fiscal year. Tagging data is summarized in Table A of the Appendix.

Of the 81 tags returned by sport and commercial gear during Fiscal Years 1968 and 1969, 63 fish were recovered in the estuarine area and 18 from points upstream. All returns from the estuarine zone occurred during the months of December through April, and in August. All tags recovered from points upstream were captured during the months of March through July (Table 9).

These data indicate that there is a definite upstream movement of striped bass during March and April. This ascent commences during the spawning season and continues through May and possibly June, for some individuals. These fish apparently remain upstream until late July, before beginning their descent. Striped bass again appear in the estuary in late fall and presumably remain until the following spring.

Of the 37 tagged fish collected by sport and commercial means during the Fiscal Year 1969, 24 were returned from the sport fishery while 13 were captured in the commercial shad gill net fishery (Table 10).

TABLE 9. Striped Bass Recovery Data from the Ogeechee and Savannah River Systems During the Period December 1967 through June 1969.

	OGEECHEE		SAVANNAH	
Month and Year	Number of Tags Returned	Location of Recapture[1/]	Number of Tags Returned	Location of Recapture[1/]
December - 1967	0	-	0	-
January - 1968	0	-	4	E
February	11	E	5	E
March	26	E (21), U (5)	5	E
April	2	E (1), U (1)	4	E
May	4	U	5	U
June	1	U	6	U
July	3	U	1	U
August	1	E	1	E
September	0	-	0	-
October	0	-	0	-
November	0	-	0	-
December	1	E	3	E
January - 1969	3	E	1	E
February	4	E	0	-
March	19	E	0	-
April	4	E (2), U (2)	1	E
May	1	U	4	E (2), U (2)
June	1	U	2	U
TOTAL	Estuary 63 Upstream 18		Estuary 26 Upstream 16	

[1/] U = Upstream
E = Estuary

TABLE 10. Summary of Tag and Recovery Data from Striped Bass Recovered in the Ogeechee River System, Georgia, During the Period July 1, 1968 through June 31, 1969.

TAG DATA						RECOVERY DATA		
Age Class	Sex	Fork Length (inch)	Weight (lb-oz)	Date Tagged	River Mileage Tagged	Days after Tagging Recaptured	Miles Traveled after Tagging[1]	Mode of Recapture[2]
II	-	12 5/8	1- 0	1/23/68	19	150	34U	S
	-	13	1- 2	1/23/68	19	369	11U	S
	-	12	1- 0	1/23/68	18	374	9U	S
	-	15 1/2	2- 3	1/10/68	16	41	4U	S
	-	10 1/4	1- 0	1/10/68	18	44	2D	C
	-	14 1/2	2- 0	1/10/68	16	44	2D	C
	-	11 3/4	1- 3	1/13/68	16	62	14U	S
	-	13 7/8	1- 2	1/13/68	18	54	3U	S
	-	13 3/4	1- 4	1/13/68	16	79	25U	S
	-	13 1/2	1- 4	1/13/68	16	44	0	C
	-	14	1-13	1/13/68	18	44	2D	C
	-	15 1/2	1- 8	1/14/68	16	13	14U	S
	-	9 1/4	0- 6	1/14/68	18	45	2U	S
	-	15 1/2	1-12	1/14/68	16	78	14U	S
	-	15	2- 2	1/14/68	16	48	14U	S
	-	14 1/4	1- 7	1/14/68	18	44	2D	C
	-	14 1/2	1- 1	1/14/68	18	44	2D	C
	-	14	1- 8	1/14/68	16	44	0	C
	-	12 1/4	1- 8	1/14/68	16	44	0	C
	-	15 1/4	2- 1	1/15/68	18	44	2D	C
						$\bar{y} = 85.4$	$\bar{y} = 6.6$	
III	♂ ripe	19 1/2	4- 2	2/12/68	16	141	96U	S
	♂ ripe	15 3/4	2- 2	2/13/68	19	140	98U	S
	-	11 1/4	0-12	11/05/68	21	115	5U	S
	-	15	1-15	1/14/69	15	47	15U	S
	-	17 1/4	2-12	1/14/69	16	49	1U	S
	-	-	3-12	1/14/69	18	53	0	S
	-	17	2- 5	1/14/69	18	44	2D	C
	-	15 3/4	1- 8	1/14/69	18	58	5U	S
						$\bar{y} = 80.9$	$\bar{y} = 27.2$	

Table 10. (continued)

TAG DATA						RECOVERY DATA		
Age Class	Sex	Fork Length (inch)	Weight (lb-oz)	Date Tagged	River Mileage Tagged	Days after Tagging Recaptured	Miles Traveled after Tagging[1]	Mode of Recapture[2]
IV	o ripe	14	1-12	2/13/68	19	178	4U	S
	-	24	5-14	1/13/69	16	79	10U	S
	-	19 3/4	4-12	1/13/69	16	82	2U	S
	-	18 1/4	2- 4	1/14/69	16	5	7U	S
						$\bar{y}$ = 86.0	$\bar{y}$ = 5.7	
V	-	23 1/2	6-14	1/14/69	16	142	112U	C
	-	21	4-10	1/15/69	18	130	18U	S
						$\bar{y}$ = 136.0	$\bar{y}$ = 65.0	
Not Discernable	-	10 7/8	0-10	2/13/68		290	4D	S
	-	13 1/4	1- 6	1/15/68		44	2D	C
	-	23 1/4	6- 7	1/30/68		28	2U	C
						$\bar{y}$ = 120.7	$\bar{y}$ = -1.3	
GRAND MEAN						90.1	13.5	

---

[1] U = Upstream from tagging location
D = Downstream from tagging location

[2] S = Sport fishery
C = Commercial fishery

Distances traveled while fish were at large ranged from 4 miles to 112 miles upstream from the tagging location (Figure 6). The mean distance was 13.5 miles. The number of days some fish remained at large before recapture ranged from 5 to 374 days with a mean value of 90.1 days (Table 10). Eight of the tags returned during the fiscal year were taken from fish tagged the previous fiscal year (1968). During Fiscal Years 1968 and 1969, a total of 352 striped bass have been tagged in the Ogeechee River System and 23.0 per cent of the tagged fish have been recaptured (Table 11).

Savannah River System

A total of 110 subadult and adult striped bass were tagged during the fiscal year. Tagging data is summarized in Table B of the Appendix.

Of the 42 tags returned by sport and commercial gear during Fiscal Years 1968 and 1969, 26 fish were recovered in the estuarine area and 16 from points upstream. All returns from the estuarine zone occurred during the months of December through May, and in August. All tags recovered from points upstream were captured during the months of May, June, and July (Table 9).

The data indicate an upstream movement of striped bass during the spawning season, similar to that observed in the Ogeechee River System. Ascent begins in April and continues through May. Fish remain upstream until late July, then descend the river. Striped bass again appear in the estuary in late fall and remain until the following spring.

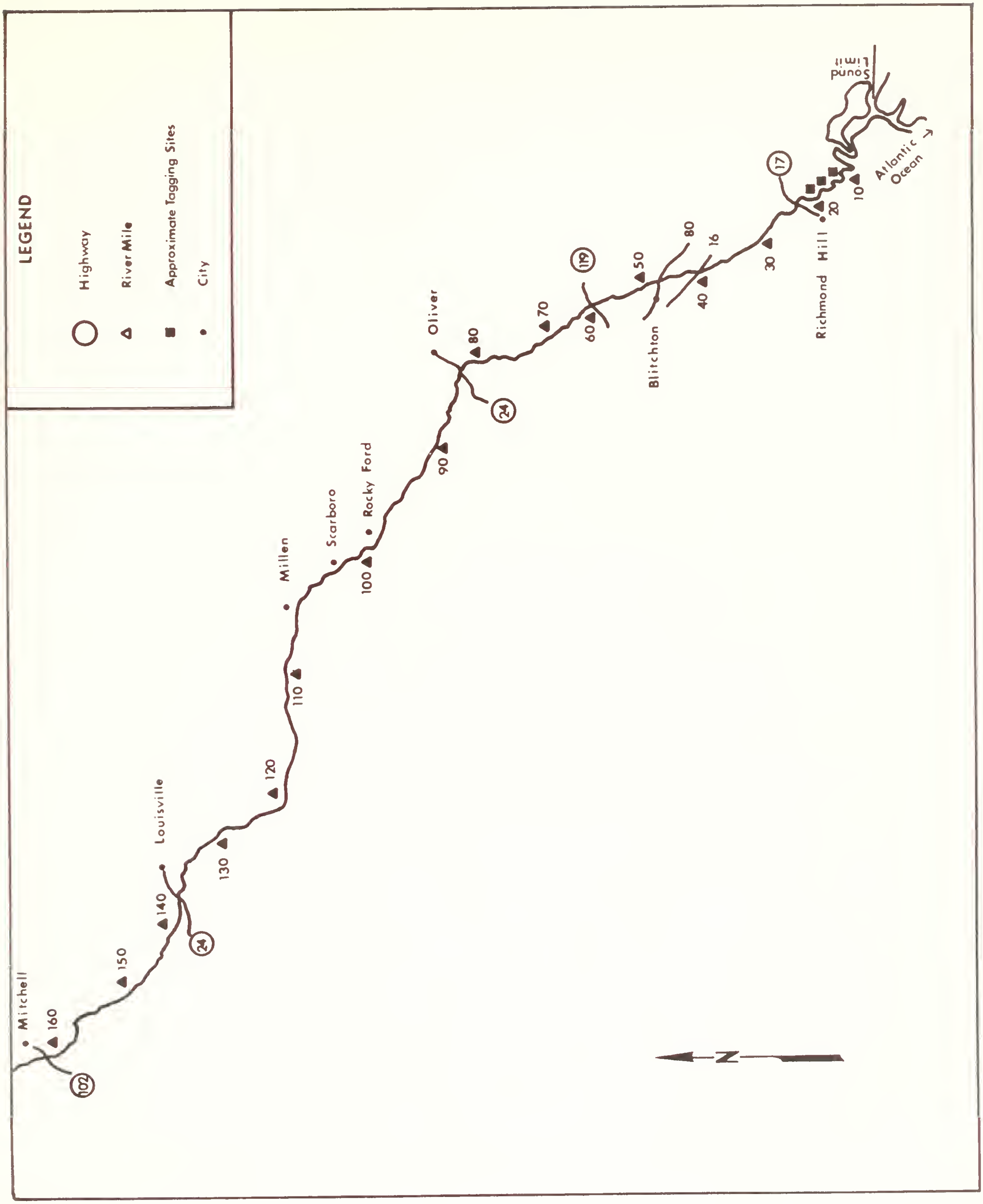

Figure 6. Ogeechee River System showing approximate river mileages from the Ossabaw Sound Limits.

TABLE 11. Tag Return Data from the Ogeechee and Savannah River Systems During the Entire Project Period.

OGEECHEE RIVER SYSTEM

Year[1/]	Number of Fish Tagged	Number Fish Returned 1967-68	Percent Return 1967-68	Number Returned 1968-69	Percent Returned 1968-69	Total Number Returned	Percent Total Returned
1967-68	221	44	19.9	8	3.6	52	23.5
1968-69	131	-	-	29	22.1	29	22.1
TOTAL	352			37	10.5	81	23.0

SAVANNAH RIVER SYSTEM

Year[1/]	Number of Fish Tagged	Number Fish Returned 1967-68	Percent Return 1967-68	Number Returned 1968-69	Percent Returned 1968-69	Total Number Returned	Percent Total Returned
1967-68	149	29	19.5	5	3.4	34	22.8
1968-69	110	-	-	8	7.3	8	7.3
TOTAL	259			13	5.0	42	16.2

[1/] Dates of each year are from July 1 of former year through June 30 of the latter year.

Of the 13 tagged fish collected by sport and commercial means during Fiscal Year 1969, 11 were returned by the sport fishery while 2 were captured by commercial fishermen using set lines for catfish (Table 12).

Distances traveled while fish were at large ranged from 5 miles downstream to 144 miles upstream from the tagging location (Figure 7). Mean distance traveled before recapture was 45.5 miles. The number of days some fish remained at large before recapture ranged from 18 to 227 days with a mean value of 119.6 days.

Five of the tags returned during the fiscal year were taken from fish tagged the previous year (1968). During Fiscal Years 1968 and 1969, a total of 259 striped bass have been tagged and 16.2 per cent of the tagged fish have been recaptured (Table 11).

DISCUSSION

As has been evidenced in both river systems, no tags have been returned during the months of September, October, and November. This may suggest a phase of the annual migration of these fish during which they are not subjected to either the sport or commercial fishery. One possibility may be that the striped bass move to an area not utilized by fishermen, such as offshore waters, during this period. At this time, however, there is no proof of this type of behavior as no tags have been returned from points outside the respective river systems.

Annual ascent of the Ogeechee River population is consistently earlier than the Savannah River population. Tagged striped bass were

TABLE 12. Summary of Tag and Recovery Data from Striped Bass Recovered in the Savannah River System, Georgia, During the Period July 1, 1968 through June 30, 1969.

TAG DATA						RECOVERY DATA		
Age Class	Sex	Fork Length (inch)	Weight (lb-oz)	Date Tagged	River Mileage Tagged	Days after Tagging Recaptured	Miles Traveled after Tagging	Mode of Recapture
0	-	9 1/2	0- 7	11/16/68	19	18	0	S
	-	8 1/2	0- 6	11/16/68	19	166	0	S
						$\bar{y}$ = 92.0	$\bar{y}$ = 0	
I	-	10 3/4	0-12	11/16/68	19	18	0	S
II	o ripe	14	1- 5	04/09/68	14	125	6U	S
	-	13 1/4	1- 5	11/16/68	19	54	0	S
	-	13 1/2	1- 3	11/16/68	19	156	0	C
	-	15 1/4	1- 8	12/05/68	14	190	144U	S
						$\bar{y}$ = 131.2	$\bar{y}$ = 37.5	
III	-	16	2- 8	01/17/68	19	176	139U	S
V	o spent	30 1/4	12-11	04/04/69	18	35	140U	S
Not Discernable	-	15 1/2	1-12	12/12/67	14	144	24U	S
	o ripe	29 1/2	13- 0	04/05/68	14	80	144U	S
	-	12 1/8	0-12	04/16/68	13	227	5D	C
	-	12 1/8	1- 3	11/16/68	19	166	0	S
						$\bar{y}$ = 154.2	$\bar{y}$ = 40.7	
GRAND MEAN						119.6	45.5	

1/ U = Upstream from tagging location
D = Downstream from tagging location

2/ S = Sport fishery
C = Commercial fishery

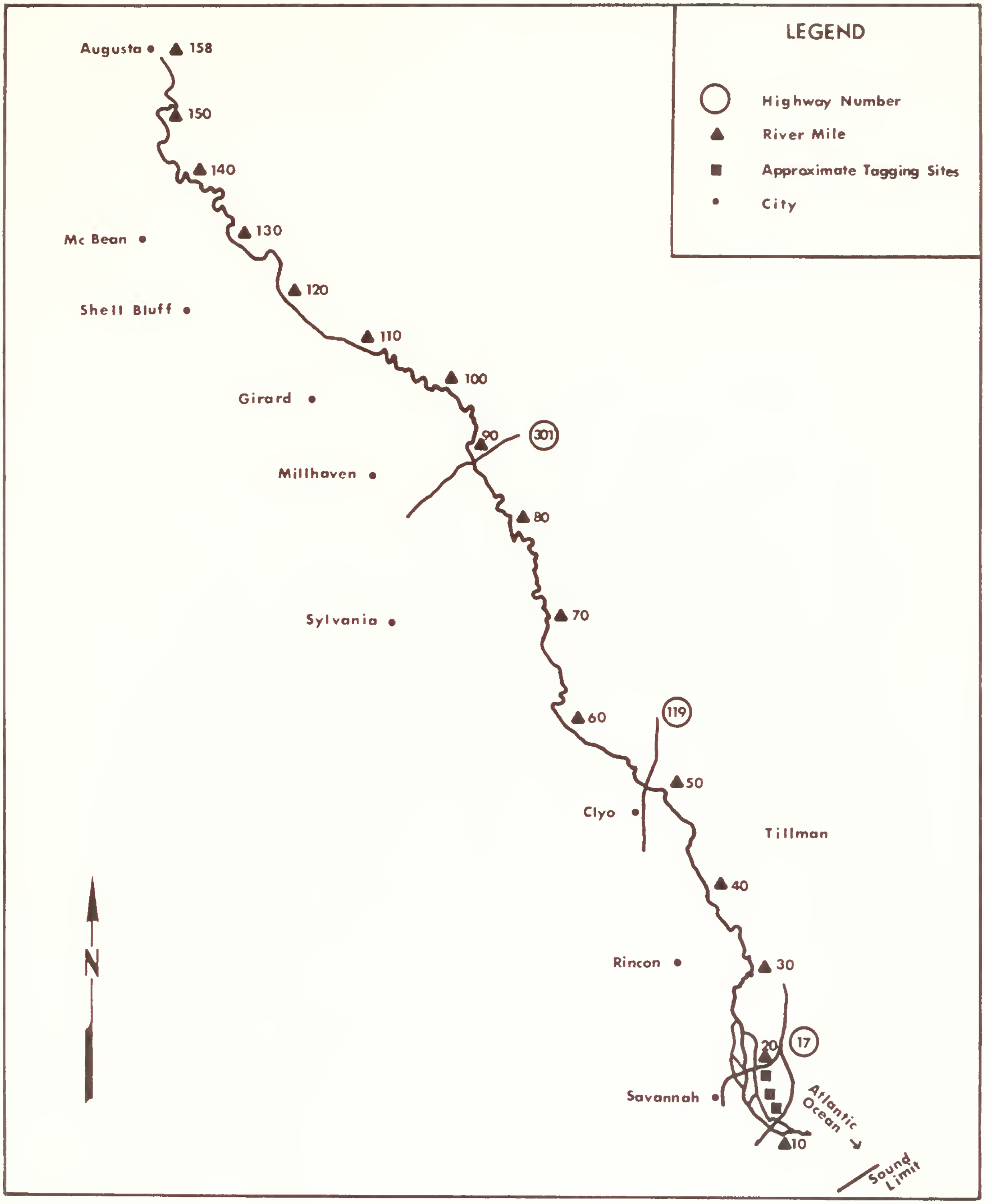

Figure 7. Savannah River System showing approximate river mileages from the Wassaw Sound Limits.

recaptured during the fiscal year at upstream locations as early as April in the Ogeechee System, while tagged fish have not appeared up the Savannah River until May (Table 9). This may be attributed to slightly warmer water temperatures, and a shorter spawning season in the Ogeechee River. Spawning continued from April 1, 1969 through May 12, 1969, in the Ogeechee River and from March 31, 1969 through May 29, 1969, in the Savannah River (Tables 3 and 4).

Descent appears to occur at approximately the same time in both river systems.

Work Plan I
Job Number IV

OBJECTIVE

It is the objective of this phase of the project to observe age class composition and growth of juvenile, subadult, and adult striped bass in the project streams.

PROCEDURE

Lengths, weights, sex data, and scales were obtained from striped bass in the Ogeechee and Savannah River Systems from July 1, 1968 through June 30, 1969. Determination of sex was made by manual extrusion of sex products during the spawning season. At other times of the year fish were sexed by dissection or classified as unknown sex and combined with all known females.

Scales were collected from the left side of the fish, above the lateral line and below the point of union of the spinous and soft dorsal fins. An Ann Arbor Roller Press and strips of cellulose acetate were used in making impressions of all scales. Scales were read on an Eberbach Microprojector with a magnification 25 power. Annual growth increment was estimated by back-calculation of length at each annulus. All fish were placed in specific age groups, based on the number of annuli present on their scales (e.g. fish of Age Group I possess one annulus on their scales).

Growth data for juveniles collected during the juvenile distribution phase of the project are also included.

Specimens were obtained by means of electrofishing apparatus and a ten-foot shrimp trawl.

RESULTS

Ogeechee River System

Age:—A total of 157 specimens were utilized during the fiscal year for age and growth studies. The population of the striped bass during the period included strong classes of two and three year old fish (Figure 8). This structure is very similar to that reported for the previous year with the exception of a slightly weaker Age Class I this year.

Female fish contributed the bulk of specimens analyzed with confirmed males appearing solely in Age Classes II and III.

Growth:—Estimates of mean fork length of various age groups of fish have been derived by combining actual measured lengths of fish with back-calculation data (Figure 9). Mean fork lengths of the respective age groups were considerably greater this year than in the previous year. The validity of back-calculating growth is shown by a comparison of the actual and calculated lengths for males and females plus unknown fish of the respective age groups (Table 13). Actual length was very nearly the same as the calculated length for each age group.

For purposes of evaluating growth, the sexes have been separated into a group consisting of males, and a group comprised of females plus all fish not positively indentified (Tables 14 and 15). Differences in growth rates of both sexes appear to be minor (Figure 10). Growth of both sexes is fairly uniform with an annual increment ranging from 3.35 to 6.20 inches fork length per year.

Perusal of length frequency data indicates a dominance of fish

OGEECHEE RIVER

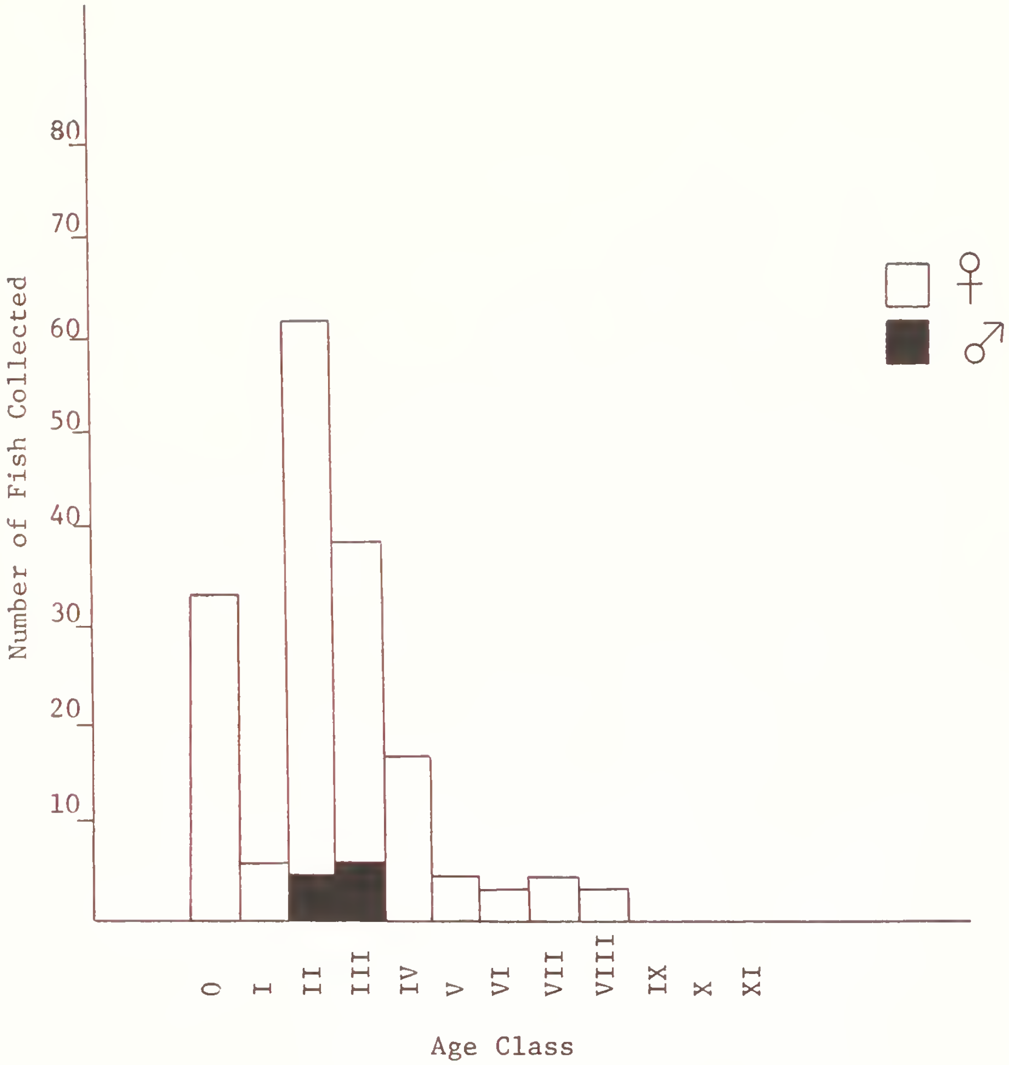

Figure 8. Age class structure in the Ogeechee River during the period July 1, 1968 through June 30, 1969.

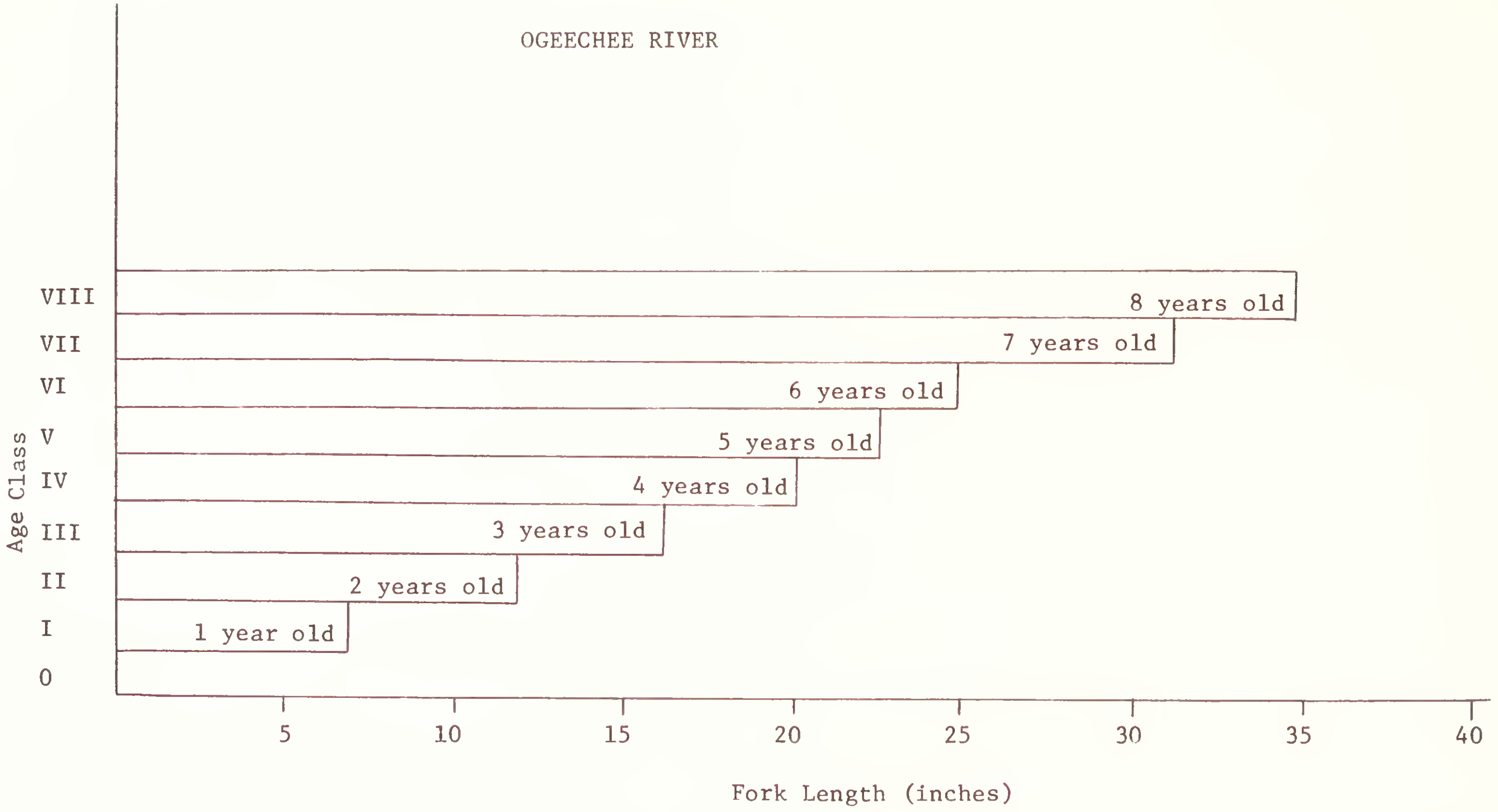

Figure 9. Mean lengths of various age groups based on actual fish examined and projected from back calculations for the Ogeechee River during the period July 1, 1968 through June 30, 1969.

TABLE 13. Comparison of Calculated Fork Lengths Versus Measured Fork Lengths of 126 Male and Female Striped Bass of Various Age Groups Tagged or Collected from the Ogeechee River During the Period July 1, 1968 through June 30, 1969.

	MALES				FEMALES AND UNKNOWN SEX			
	Mean Length (inch)		Number of Fish		Mean Length (inch)		Number of Fish	
Age Group	Measured	Calculated	Measured	Calculated	Measured	Calculated	Measured	Calculated
I	-	6.08	0	13	8.67	6.10	5	113
II	11.25	10.95	3	13	13.17	12.30	56	108
III	16.43	16.87	7	10	16.29	16.15	30	52
IV	21.33	20.90	3	3	18.67	19.75	12	22
V	-	-	0	-	21.50	23.30	3	10
VI	-	-	0	-	23.00	26.68	2	7
VII	-	-	0	-	30.96	31.20	3	5
VIII	-	-	0	-	34.87	34.55	2	2

TABLE 14. Calculated Fork Lengths in Inches for Male Striped Bass Tagged or Collected in the Ogeechee River During the Period July 1, 1968 through June 30, 1969.

Age Group	Year Class	Fork Length at Capture	Number of Fish	Calculated Fork Length (inches) for End of Year								
				1	2	3	4	5	6	7	8	9
I	1967	-	0									
II	1966	11.25	3	5.93	9.10							
III	1965	16.43	7	6.00	12.09	16.06						
IV	1964	21.33	3	6.30	11.67	17.67	20.90					
V	1963	-	0									
VI	1962	-	0									
VII	1961	-	0									
VIII	1960	-	0									
IX	1959	-	0									
X	1958	-	0									
XI	1957	-	0									
XII	1956	-	0									
Grand Average				6.08	10.95	16.87	20.90					
Average Annual Growth Increment				6.08	4.87	5.92	4.03					
Number of Fish			13	13	13	10	3					

TABLE 15. Calculated Fork Lengths in Inches for the Group of Striped Bass Consisting of Females and Fish of Unknown Sex, Tagged or Collected in the Ogeechee River System During the Period July 1, 1968 through June 30, 1969.

Age Group	Year Class	Fork Length at Capture	Number of Fish	Calculated Fork Length (inches) for End of Year								
				1	2	3	4	5	6	7	8	9
I	1967	8.67	5	5.44								
II	1966	13.17	56	5.18	11.26							
III	1965	16.29	30	6.23	11.92	15.36						
IV	1964	18.67	12	5.36	9.74	14.78	17.71					
V	1963	21.50	3	5.00	11.90	15.40	18.63	21.27				
VI	1962	23.00	2	6.35	13.00	15.30	17.95	20.30	23.15			
VII	1961	30.96	2	8.13	13.40	18.52	22.53	26.17	28.30	30.40		
VIII	1960	34.87	2	7.10	14.90	17.55	21.95	25.45	28.60	32.00	34.55	
IX	1959											
X	1958											
XI	1957											
XII	1956											
Grand Average				6.10	12.30	16.15	19.75	23.30	26.68	31.20	34.55	
Average Annual Growth Increment				6.10	6.20	3.85	3.60	3.55	3.38	4.52	3.35	
Number of Fish			113	113	108	52	22	10	7	5	2	

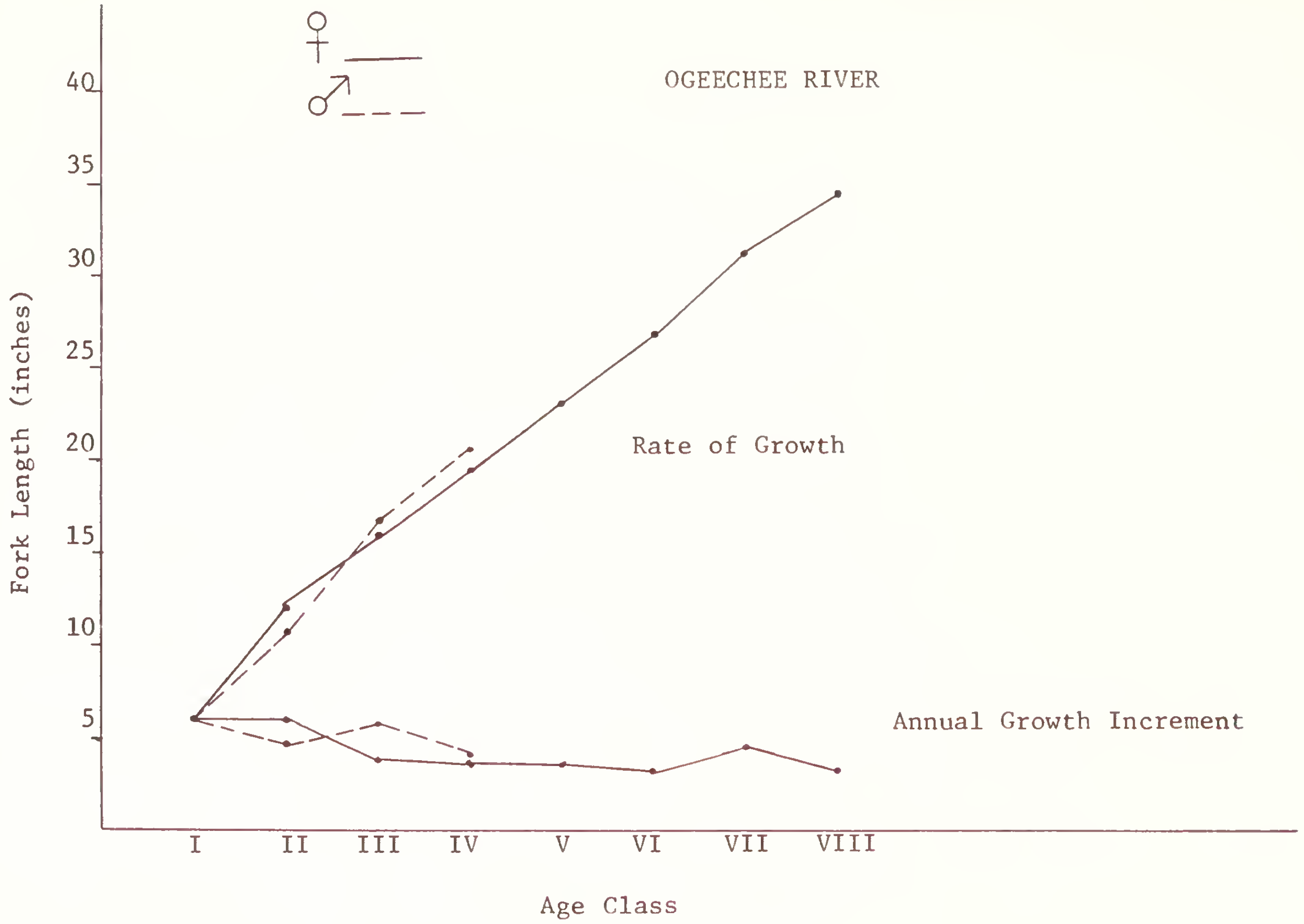

Figure 10. Rate of growth and annual growth increment for males and females plus fish of unknown sex in the Ogeechee River System during the period July 1, 1968 through June 30, 1969.

of the 14 and 15 inch groups (Figure 11). This is compared with the dominance of fish of inch groups 11, 12, and 13 the previous year.

It is interesting to note that the population of striped bass in the Ogeechee River System this year is composed of predominantly younger, larger, and fewer fish than the previous year.

Savannah River System

Age:—A total of 103 specimens were utilized during the fiscal year for age and growth studies. The population of striped bass included strong classes of one and two year old fish, with a fair representation of fish of Age Class 0 (Figure 12). When compared with similar data reported the preceeding year, it is evident that the age class composition is composed of considerably greater percentage of young fish this year. All males were observed to be two years old or older.

Growth:—Estimates of mean fork length of various age groups of fish have been derived by combining actual mearsured lengths with back-calculation data (Figure 13). As was evidenced in the Ogeechee River System, mean fork lengths of the respective age groups were considerably greater this year than in the previous year. The validity of back-calculating growth is shown by a comparison of the actual and calculated lengths for males and females plus unknown fish of the respective age groups (Table 16). Actual length, as was evidenced the previous year, is very nearly the same as calculated lengths for each age group.

For purposes of evaluating growth, the sexes are discussed individually (Tables 17 and 18). Rate of growth for female fish was

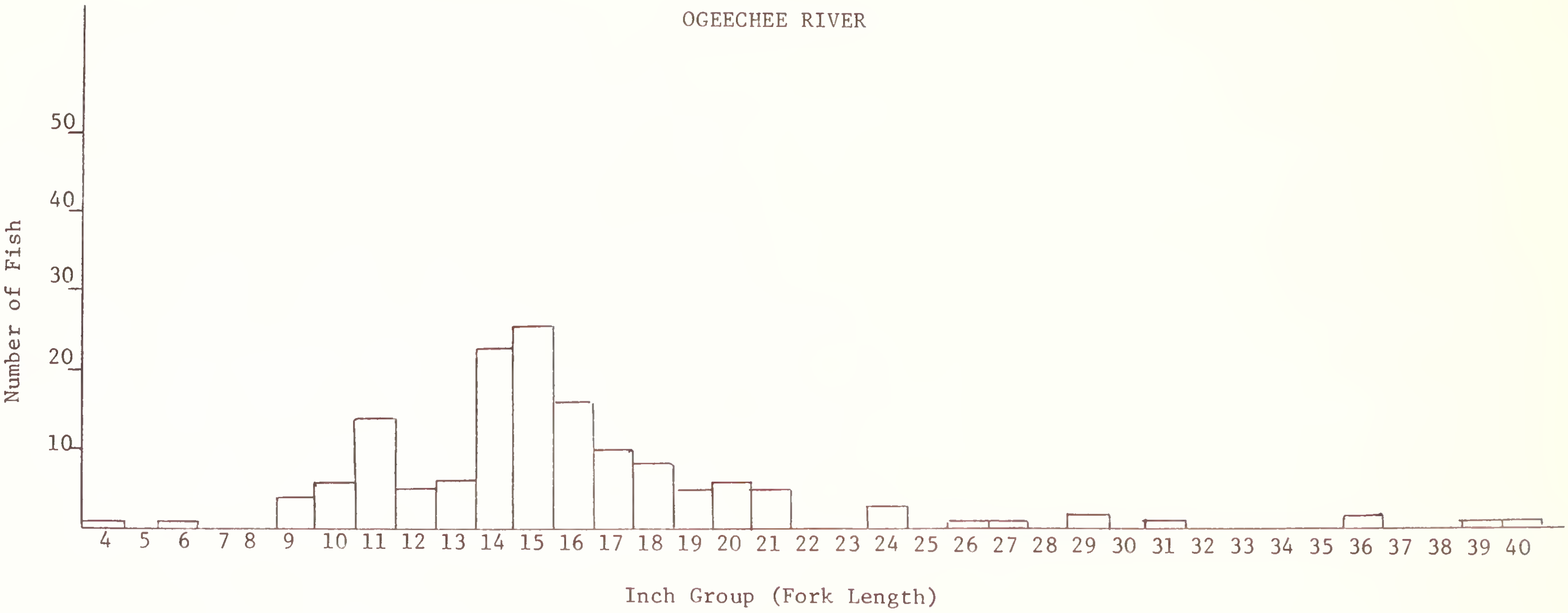

Figure 11. Length frequency of striped bass collected or tagged using electrofishing gear in the Ogeechee River System during the period July 1, 1968 through June 30, 1969.

SAVANNAH RIVER

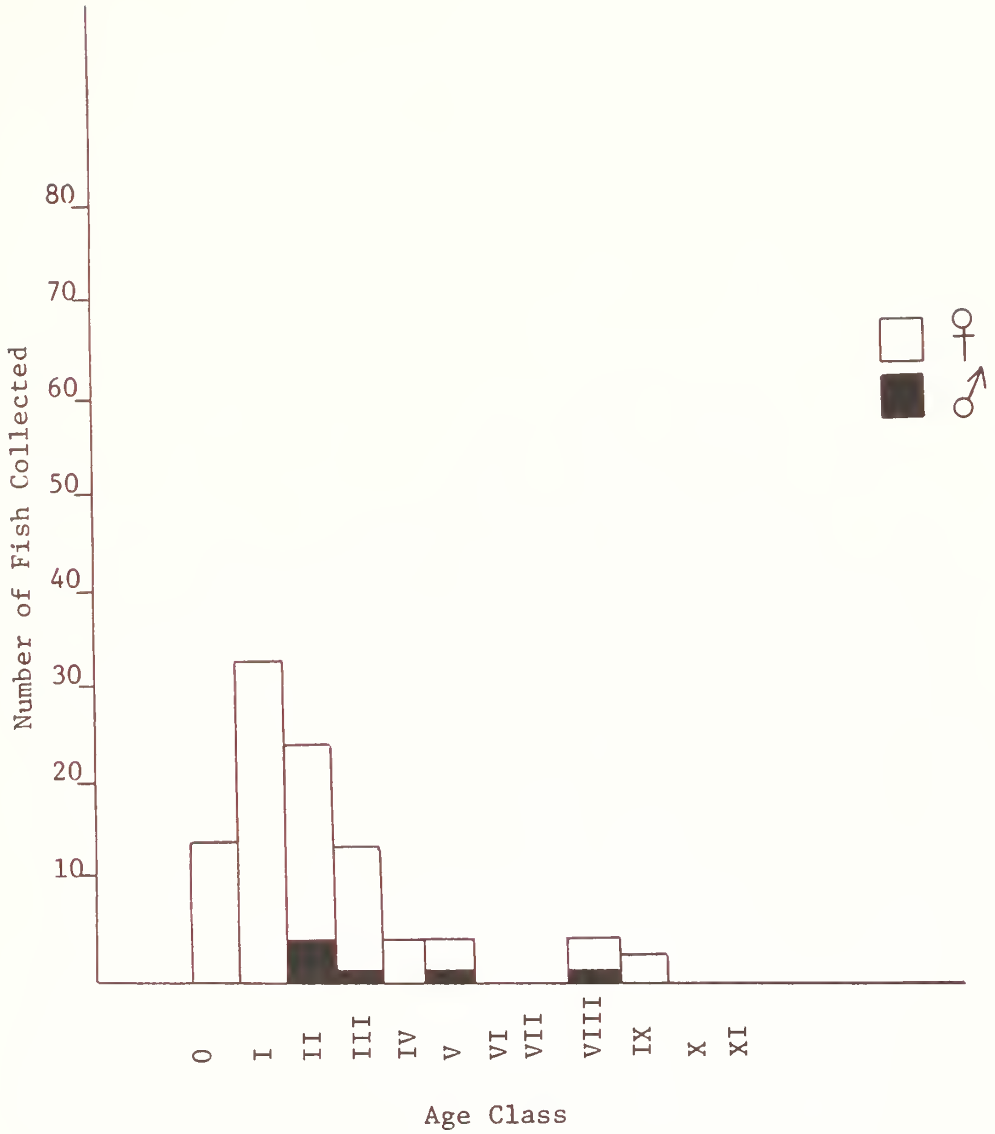

Figure 12. Age class structure in the Savannah River during the period July 1, 1968 through June 30, 1969.

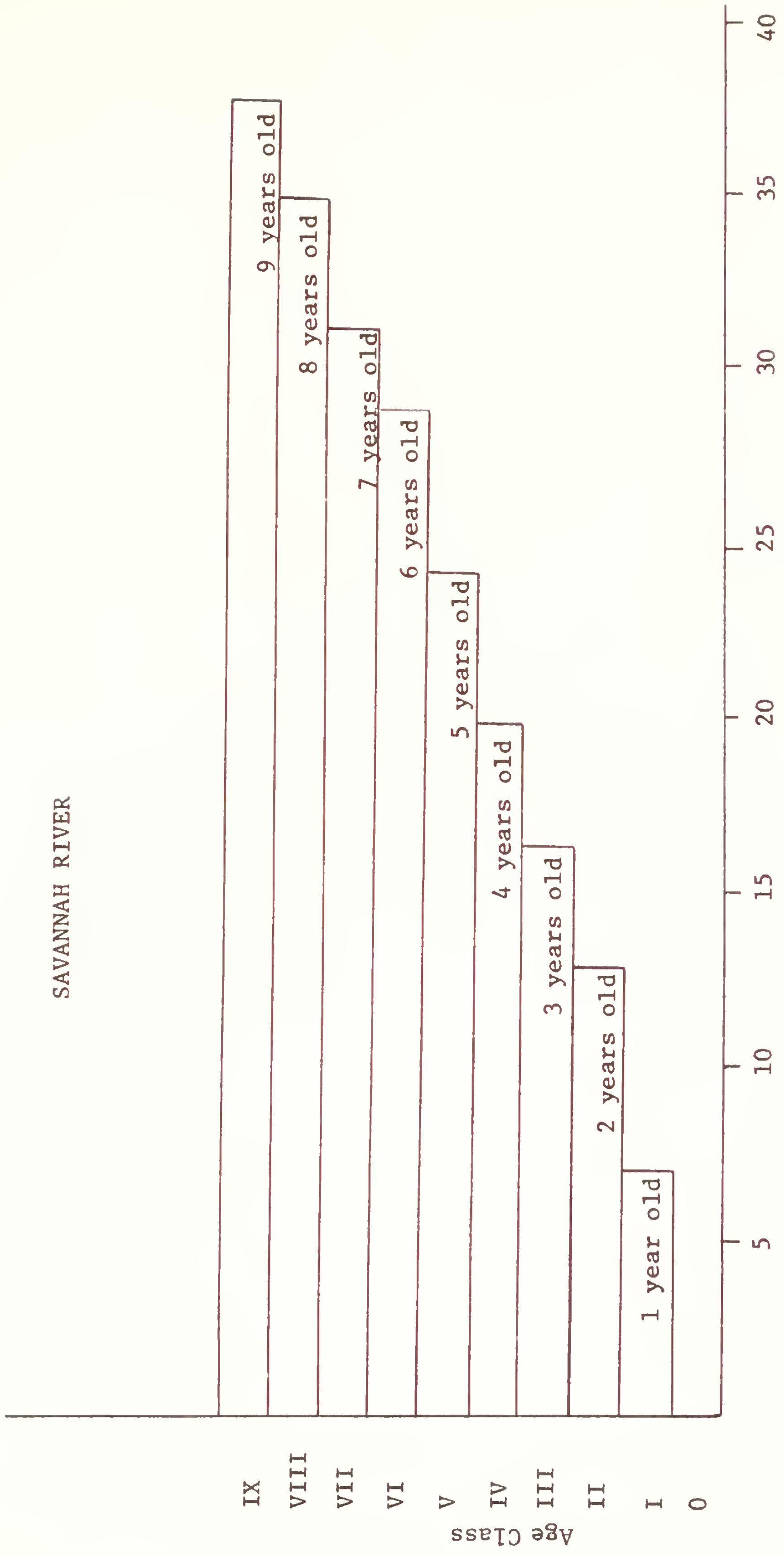

Figure 13. Mean lengths of various age groups based on actual fish examined and projected from back calculations for the Savannah River during the period July 1, 1968 through June 30, 1969.

TABLE 16. Comparison of Calculated Fork Lengths Versus Measured Fork Lengths of 89 Male and Female Striped Bass of Various Age Groups Tagged or Collected from the Savannah River During the Period July 1, 1968 through June 30, 1969.

	MALES				FEMALES AND UNKNOWN SEX			
	Mean Length (inch)		Number of Fish		Mean Length (inch)		Number of Fish	
Age Group	Measured	Calculated	Measured	Calculated	Measured	Calculated	Measured	Calculated
I	-	5.66	0	5	8.90	6.44	42	84
II	13.83	12.57	3	5	13.37	12.10	19	42
III	17.50	15.46	1	2	16.08	16.86	11	23
IV	-	18.00	0	1	20.33	20.94	3	12
V	21.75	21.90	1	1	28.13	25.36	2	9
VI	-	-	0	-	-	28.93	0	7
VII	-	-	0	-	30.50	21.83	1	7
VIII	-	-	0	-	35.00	34.88	3	6
IX	-	-	0	-	38.00	37.13	3	3

TABLE 17. Calculated Fork Lengths in Inches for Male Striped Bass Tagged or Collected in the Savannah River System During the Period July 1, 1968 through June 30, 1969.

Age Group	Year Class	Fork Length at Capture	Number of Fish	Calculated Fork Length (inches) for End of Year								
				1	2	3	4	5	6	7	8	9
I	1967	-	0									
II	1966	13.83	3	5.90	12.40							
III	1965	17.50	1	6.70	11.90	14.82						
IV	1964	-	0									
V	1963	21.75	1	4.40	13.40	16.10	18.00	21.90				
VI	1962	-	0									
VII	1961	-	0									
VIII	1960	-	0									
IX	1959	-	0									
X	1958	-	0									
XI	1957	-	0									
XII	1956	-	0									
Grand Average				5.6	12.57	15.46	18.00	21.90				
Average Annual Growth Increment				5.6	6.9	2.89	2.54	3.90				
Number of Fish			5	5	5	2	1	1				

TABLE 18. Calculated Fork Lengths in Inches for the Group of Striped Bass Consisting of Females and Fish of Unknown Sex, Tagged or Collected in the Savannah River During the Period July 1, 1968 through June 30, 1969.

Age Group	Year Class	Fork Length at Capture	Number of Fish	Calculated Fork Length (inches) for End of Year								
				1	2	3	4	5	6	7	8	9
I	1967	8.90	42	6.85								
II	1966	13.37	19	5.88	11.26							
III	1965	16.08	11	5.58	10.93	14.80						
IV	1964	20.33	3	5.33	11.00	15.03	18.20					
V	1963	28.13	2	9.55	15.15	20.15	24.00	26.60				
VI	1962	-	0	-								
VII	1961	30.50	1	5.60	11.40	16.00	19.20	22.60	26.90	29.90		
VIII	1960	35.00	3	5.20	11.63	16.23	20.30	25.90	29.40	21.90	34.13	
IX	1959	38.00	3	7.50	13.33	18.93	23.00	26.33	30.47	33.70	35.63	37.13
X	1958	-	0	-								
XI	1957	-	0	-								
XII	1956	-	0	-								
Grand Average				6.44	12.10	16.86	20.94	25.36	28.92	31.83	34.88	37.13
Average Annual Growth Increment				6.44	5.66	4.76	4.08	4.42	3.56	2.91	3.05	2.25
Number of Fish			84	84	42	23	12	9	7	7	6	3

extremely uniform with a steady and gradual decline in annual increment (Figure 14). Growth of male fish was much more sporadic. It is probable that insufficient numbers of male specimens were utilized to give an accurate representation, as just five specimens were obtained. Annual increment in fork length ranged from 2.25 to 6.44 inches in the females and 2.54 to 6.91 inches in the male fish.

Perusal of length frequency data indicates a preponderance of fish from inch groups 8 and 9 (Figure 15). This is compared with a dominance of fish of inch groups 13, 14, and 15 the previous year. These data further support the conclusion drawn about the age class composition in the river system this year.

The population of striped bass in the Savannah River System this year is composed of predominantly younger, smaller, and fewer fish than the previous year.

GENERAL OBSERVATIONS

This segment of the report deals briefly with background information, not specifically mentioned in project documents.

Knowledge of the approximate time of annulus formation is essential to the accurate interpretation of life history information. During scale reading operations, observations were made about the position of the outermost annulus with respect to the margin of the scale. It was possible to ascertain that 64 of the 260 fish utilized for age and growth studies were in the process of or had just formed annuli.

The data indicate that striped bass in the Ogeechee River System

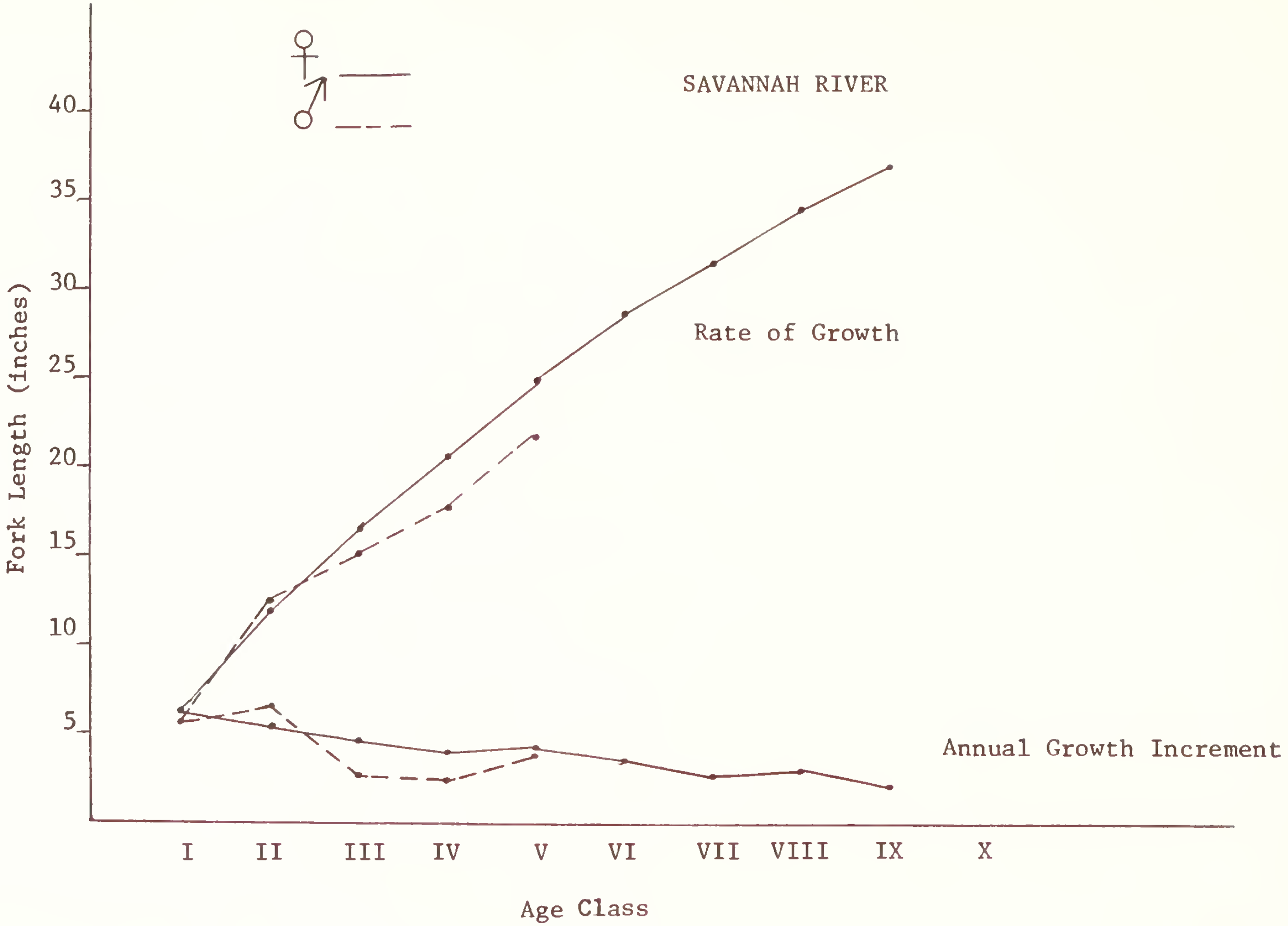

Figure 14. Rate of growth and annual growth increment for males and females plus fish of unknown sex in the Savannah River System during the period July 1, 1968 through June 30, 1969.

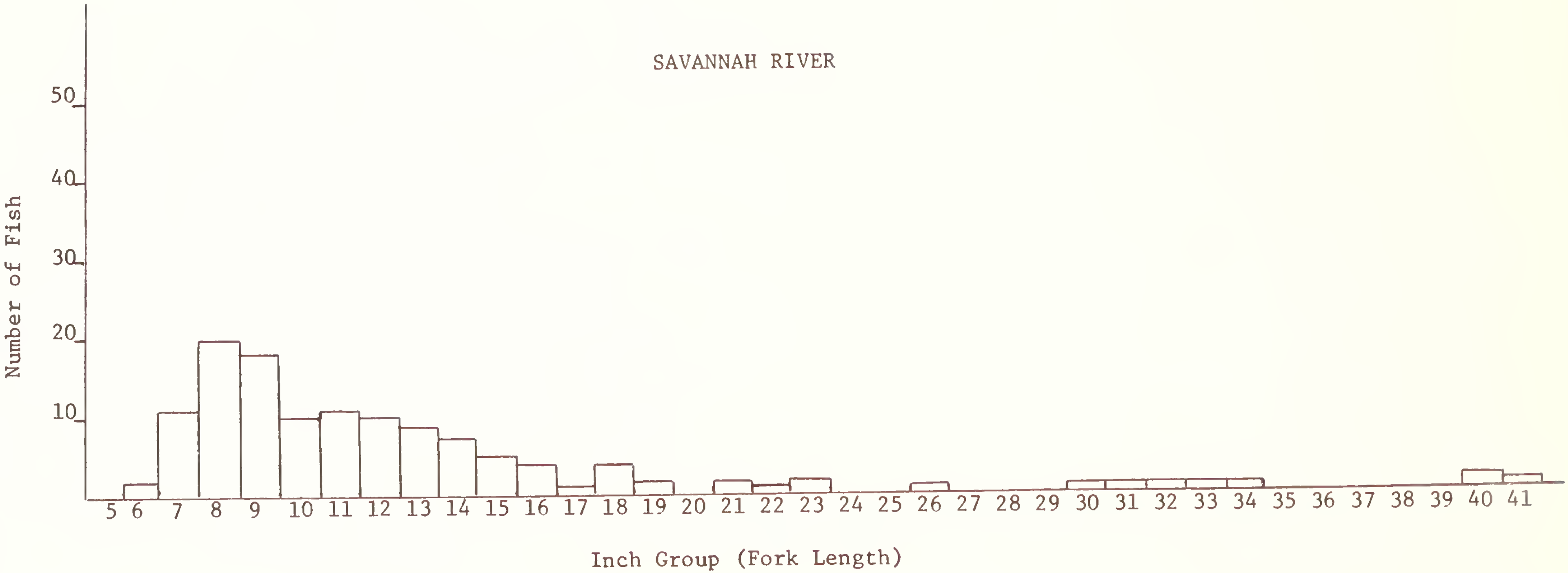

Figure 15. Length frequency of striped bass collected or tagged using electrofishing gear in the Savannah River System during the period July 1, 1968 through June 30, 1969.

deposit annuli during the months of November through April, but primarily in December and January. Savannah River fish formed annuli during the months of November through March with a steady increase in number of fish forming annuli through this period, showing a peak in March (Figure 16). These dates correspond approximately to the period in which striped bass are utilizing the estuarine environment. It appears that annulus formation culminates with the onset of the spawning season.

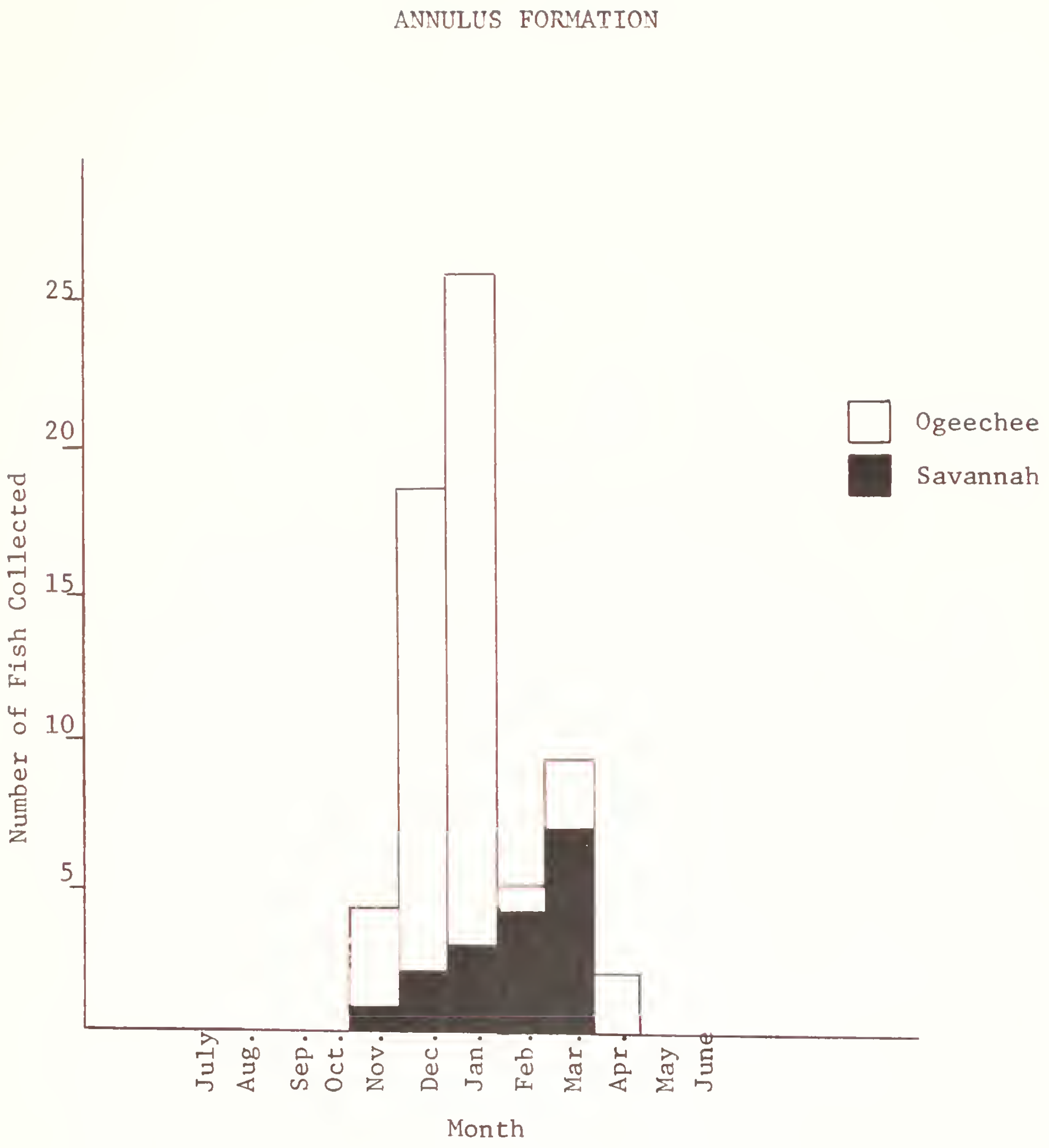

FIGURE 16. Observations on Annulus Formation, based on aging of striped bass scales, during the period July 1, 1968 through June 30, 1969.

LITERATURE CITED

Davis, 1959. Field Tests of Peterson, Streamer and Spaghetti Tags on Striped Bass, *Roccus saxatilis* (Walbaum). Trans. Amer. Fish Soc., 88(4): 319-329.

APPENDIX

TABLE A. Data on Striped Bass Tagged in the Ogeechee River System During the Period July 1, 1968 through June 30, 1969.

Tag Number	Date	Location	Length (inch)	Weight (lb)	(oz)	Sex
E-400	11/05/68	Ford Mansion	11 1/4		12	-
401	"	"	10 3/8		11	-
440	01/10/69	Below White Hall	14 1/2	1	12	-
441	"	"	19	4	2	-
442	"	"	15 1/4	2	3	-
443	"	"	19 3/4	4	9	-
444	"	"	12 7/8	1	4	-
445	"	"	15 3/4	2	4	-
446	"	"	10 1/2	1		-
447	"	"	10 1/4	1		-
448	"	"	20 1/2	4	14	-
449	"	"	14 1/4	1	11	-
450	"	"	18	3	5	-
451	"	"	15	1	14	-
452	"	"	11 1/4	1		-
453	"	Elliot-Orange Creek	20 1/2	4	6	-
454	"	"	14 1/2	1	14	-
455	"	"	13 1/4	1	8	-
456	"	"	14 1/4	2		-
457	"	"	11 1/8		13	-
458	01/13/69	White Hall	14	1	14	-
459	"	"	11	1		-
460	"	"	16 1/4	2	1	-
461	"	"	13 1/2	1	4	-
462	"	"	16 3/4	2	4	-
463	"	"	11 3/4	1	3	-
464	"	"	24	5	14	-
465	"	"	31	15	1	-
466	"	"	9 3/4		8	-
467	"	"	13 3/4	1	5	-
468	"	Below Elliot Creek	15	1	10	-
469	"	"	15 5/8	2	2	-
470	"	"	16	1	14	-
471	"	"	21 1/4	5	10	-
472	"	"	17 1/4	2	8	-
473	"	"	14 1/2	1	8	-
474	"	"	19	4		-
475	"	"	13 3/4	1	7	-
476	"	"	15	1	10	-
477	"	"	14	1	6	-
478	"	"	13	1	3	-

Table A. (continued)

Tag Number	Date	Location	Length	Weight		Sex
			(inch)	(lb)	(oz)	
E-479	01/13/69	Below Elliot Creek	14 3/4	1	11	-
480	"	"	16 1/2	2	4	-
481	"	"	19 3/4	4	12	-
482	"	"	16 1/2	2	4	-
A-030	01/14/69	"	8 3/4		5	-
031	"	"	8 3/4		6	-
032	"	Ogeechee Fish Camp	28 3/4	11		-
033	"	"	19 3/4	4		-
034	01/15/69	"	14 3/4		15	-
035	01/14/69	"	10 1/2		12	-
036	"	"	16	2	8	-
037	"	"	1618	2		-
038	"	"	18 1/2	2	12	-
039	"	"	21	4	8	-
040	"	"	14	1	8	-
041	"	"	19 1/2	2	8	-
042	"	"	14 1/2	1	1	-
043	"	"	15 1/4	1	1	-
044	"	"	14 1/4	1	7	-
045	"	"		3	12	-
046	01/15/69	"	17 1/2	2	8	-
047	"	"	15 3/4	1	8	-
048	"	"	11 1/4		9	-
049	"	"	15 1/4	1	12	-
050	"	"	17 1/4	2	3	-
051	"	"	12 1/2	1	3	-
052	"	"			6	-
053	"	"	21	4	10	-
054	"	"	13 3/4	11	6	-
055	"	"	15 1/2	2	8	-
056	"	"	14 1/4	1	12	-
057	"	"	17	2	4	-
058	"	"	16 1/2	2	8	-
059	"	"	13 3/4	1	6	-
060	"	"	18 3/4	3	8	-
061	"	"	14 3/4	2		-
062	"	"	11 3/4	-	3	-
063	"	"	17 1/2	2	12	-
064	"	"	12 1/2	1		-
065	"	"	19 1/2	4	8	-
066	"	Sterling Creek	23 1/2	6	8	-
098	03/29/69	Ogeechee Fish Camp	20 1/2	4	6	-
1 17	03/24/69	"				♀

Table A. (continued)

Tag Number	Date	Location	Length (inch)	Weight (lb)	(oz)	Sex
E-483	01/13/69	Below Elliot Creek	14 1/2	1	6	o imm.
484	"	"	13 3/4	1	4	-
485	"	"	14 1/2	1	7	-
486	"	"	18 3/4	3		-
487	"	White Hall	29		14	-
488	"	Ogeechee Fish Camp	14	1	13	-
489	"	"	16	2	6	-
490	"	"	15	2		-
491	"	"	13 7/8	1	2	-
492	"	"	21 3/4	6	4	-
493	01/14/69	Elliot Creek	15 1/2	1	12	-
494	"	"	14 3/4	1	12	-
495'	"	"	14	1	8	-
496	"	"	14 1/8	1	3	-
497	"	"	14 1/4	1	8	-
498	"	"	15	1	13	-
499	"	"	14 1/4	1	8	-
A-000	"	"	18 1/2	2	14	-
001	"	"	15	2	2	-
002	"	"	14 1/4	1	-8	-
003	"	"	16 3/4	2	6	-
004	"	"	17	2	5	-
005	"	"	25 3/4	8	8	-
006	"	"	23 1/2	6	14	-
007	"	"	18	3	8	-
008	"	"	10 3/4		12	-
009	"	"	9 3/4		12	-
010	"	"	13 3/4	1	8	-
011	"	"	15 1/2	1	8	-
012	"	"	10 1/2		9	-
013	"	"	12	1	2	-
014	"	"	16 1/2	2	6	-
015	"	"	8 1/2		3	-
016	"	"	15	1	12	-
017	"	"	15 1/2	2	2	-
018	"	Below Elliot Creek	14 1/4	1	7	-
019	"	"	14	1	4	-
020	"	"	17 1/4	2	12	-
021	"	"	17 1/2	2	12	-
022	"	"	15	1	15	-
023	"	"	9 1/2		6	-
024	"	"	18 1/4	2	4	-
025	"	"	9		4	-
026	"	"	17 1/2	2	8	-
027	"	"	14 1/2	1	5	-
028	"	"	15	2		-
029	"	"	11		12	-

TABLE B. Data on Striped Bass Tagged in the Savannah River System During the Period July 1, 1968 through June 30, 1969.

Tag Number	Date	Location	Length (inch)	Weight (lb)	(oz)	Sex
E-402	11/16/68	Power Plant - Port Wentworth	13 3/8		14	-
403	"		13 1/2	1	8	-
404	"	"	11 1/2		15	-
405	"	"	10 3/4		11	-
406	"	"	7 3/4		6	-
407	"	"	21	5		-
408	"	"	17 5/8	3	2	-
409	"	"	10 3/4		12	-
410	"	"	11		12	-
411	"	"	13 1/2	1	3	-
412	"	"	13 1/8	1	2	-
413	"	"	12		14	-
414	"	"	20 1/2	5		-
415	"	"	9 3/4		8	-
416	"	"	12 1/2	1	1	-
417	"	"	12 1/8		15	-
418	"	"	10		9	-
419	"	"	12	1	1	-
420	"	"	14 3/4	1	10	-
421	"	"	13 1/4	1	5	-
422	"	"	11 1/8		12	-
423	"	"	11 3/4		13	-
424	"	"	8		4	-
425	"	"	11 1/2		12	-
426	"	"	12 1/8	1	3	-
427	"	"	11 3/8		12	-
428	"	"	6 1/2		4	-
429	"	"	11 7/8	1		-
430	"	"	8 1/4		7	-
431	"	"	9		8	-
432	"	"	8 1/2		6	-
433	"	"	8 3/8		6	-
434	"	"	9 1/2		7	-
435	"	"	8 1/2		5	-
436	"	"	8		6	-
437	"	"	11 1/2		13	-
438	"	"	14 3/4	1	8	-
439	"	"	19 1/8	4	10	-
A-099	03/21/69	Front River Steam Plant	11		11	-
100	"		13 3/4	1	9	-
101	"	"	13 3/4	1	5	-

Table B. (continued)

Tag Number	Date	Location	Length (inch)	Weight (lb)	Weight (oz)	Sex
A-102	03/21/69	Front River Steam Plant	9		6	-
103	"	"	9 1/4		7	-
104	"	"	15 1/4	1	12	-
105	"	"	8 1/2		4	-
106	"	"	18 1/4	3	4	-
108	"	"	17 1/2	2	14	-
109	"	"	8		6	-
110	"	"	9		8	-
111	"	"	12 3/4	1	3	-
112	"	"	13 1/4	1	4	-
113	"	"	11		12	-
114	"	"	8 3/4		7	-
115	"	"	8 3/4		7	-
116	"	"	9 1/4		8	-
118	04/03/69	"	9 1/2		8	-
119	"	"	8		4	-
120	"	"	7 1/2		4	-
121	"	"	9 3/4		7	-
122	"	"	8		4	-
123	"	"	10 1/2		9	-
124	"	"	11		12	-
125	"	"	9 3/4		7	-
126	"	"	11 1/4		9	-
127	"	"	7 3/4		3	-
128	"	"	8 1/2		4	-
129	"	"	10		8	-
130	"	"	14 1/2	1	12	-
131	"	"	12	1		-
132	"	"	10		8	-
133	"	"	12 3/4	1	8	-
134	"	"	15 1/2	2	4	-
135	"	"	13 1/2	1	4	-
136	"	"	9		8	
137	"	"	8		5	-
138	"	"	9 3/4		5	-
139	"	"	8 1/2		3	-
140	"	"	8		3	-
141	"	"	8		3	-
142	"	Middle River	16 3/8	2	4	-
143	"	"	12 1/2		14	-
144	04/04/69	Middle River-Us 17 Bridge	30 1/4	12	11	o Spent
145	"	Middle River-3mi. Above 17	40 1/2	34		o Spent
146	"	Power Plant-	14 1/4		12	-
147	"	Port Wentworth	14 3/4	1	8	-

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